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ELECTRICAL WORLD

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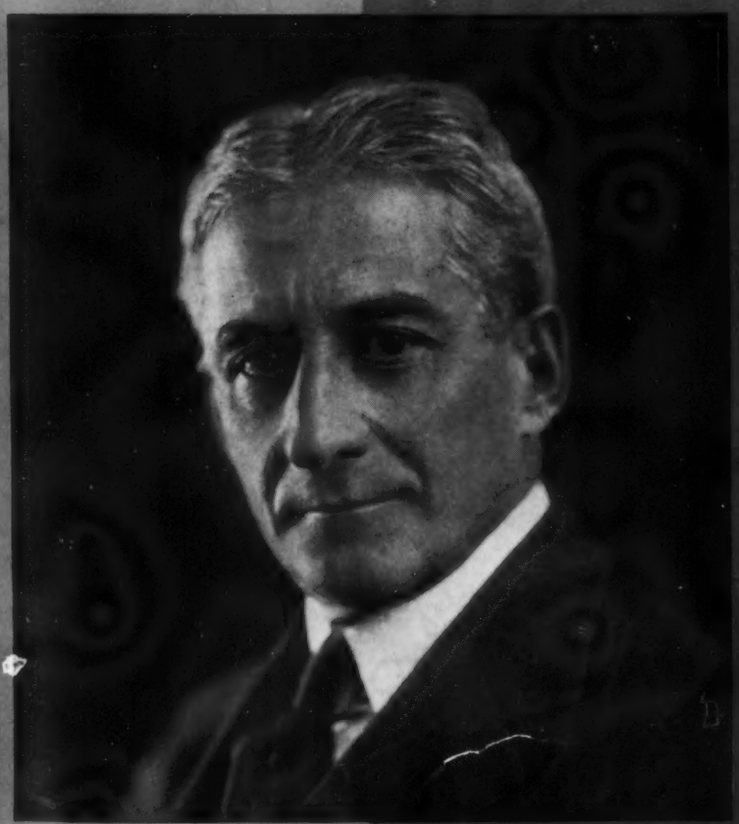

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THIS INDEX is merely a convenient guide. Many articles will appeal to several reader groups—many will apply to all. News and other departments are of general interest.

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This Issue...In Review

▶▶▶CALIFORNIA does things in a big way. In customary fashion the state contracts for the largest water supply and power project in the world. Boulder Dam is the last word in magnitude and in power development. It is rapidly nearing completion. It involves management, financial, political, technical and operating problems of major magnitude. We publish in this issue the latest word on the subject. The contractual features, the new technical developments, the current policies and the hopes and ambitions. Every one in the electrical industry should be interested in an article so full of new ideas and suggestions and descriptive of the biggest undertaking of recent years. The latest word in transmission, in generation, in switching, in construction equipment, Boulder Dam is a step forward in equipment and in practice. It indicates what must be done in the future.

▶▶▶WE HEAR much of the British Grid and very little about our own much larger grids. Operation of our large systems is taken too much for granted. If customers, executives and others go out on an extended transmission system during a thunderstorm they will find out what a combination of intelligence, action and equipment is needed to maintain service. J. W. Graff and J. T. Johnson of the Alabama Power Company tell of new equipment and give new ideas for system restoration in their article in this issue. Once again the vacuum tube finds a new application. Makers and users of instrument transformers, meters and capacitor bushings should note this development.

▶▶▶TWO OR THREE months ago a harassed executive in charge of distribution said: "This distribution equipment is a bunch of junk. I can't maintain service on ranges, oil burners, water heaters and other devices in any kind of a storm. When we had lights only we had all day to repair damages, now customers yell to high heaven." This started us thinking. A little investigation showed that distribution operators more or less agreed with the statement and many of them had already introduced new equipment and new ideas. So we made a survey of thoughts and practices. The results are in this issue. We drew no conclusions except that engineers, manufacturers and operators had better get busy and study this subject. There is going to be new equipment and remodeled old equipment. Even cable manufacturers might well turn some of their research workers away from dielectric minutiæ to field research in overhead distribution. Line hardware, relays, transformers — a host of items are involved. This survey affords a work sheet for a large part of the electrical industry.

▶▶▶IT HAS been said that anything new in industrial plants is always electrical. This is borne out by the story of H. S. Stewart in this issue. Production machines under a heavy duty reversing cycle can be given a fast return movement by using two motors directly connected—one for each motion—with adequate disconnecting and plugging. This is a new technical development that should interest industrial engineers, power salesmen and manufacturers. The article shows that 1870 methods do not apply today in factory production.

▶▶▶OUR FRIEND G. T. Shoemaker says that reducing the fuel cost in a boiler plant 25 per cent is good business when an investment in fuel-saving equipment will retire itself in 2½ years. We agree and wonder how many other boiler houses in power stations will go and do likewise. And we forgot to add that the steam production was also increased 25 per cent. And this power plant was built only nine years ago—it was no Noah. Executives, station engineers and equipment manufacturers should get some good tips from this article.

▶▶▶SOME of the government bureaus make valuable surveys. A case in point is a survey of several cities on use of lighting, cooking and refrigeration. The largest proportion of users of electric light was found in Seattle, 98.5 per cent, but in Charleston, S. C., only 4.98 per cent used it. The figures on saturation are low. If we assume 25 per cent for refrigeration we need to sell 2,000,000 units to reach it. And for the same saturation in ranges, 4,000,000 must be sold. And this saturation would increase the present domestic consumption of electricity 75 per cent. With this market available why should the industry be discouraged?

▶▶▶A GOOD job of engineering and sales is told by Charles Stoeckly in this issue—a brewery bettered its heat balance, rearranged its plant for more convenient and more economical operation and tied into the utility power supply effectively. An outside consulting engineer did this work. Power salesmen, industrial engineers and manufacturers should get some new ideas on sales approach from this splendid article.

▶▶▶OUT of El Paso come some further data on the trial-rental of ranges and water heaters. The statistics on a six-month experience are now in, showing repossessions, reissues, increment costs, earnings, and so on, resulting from the placing of this equipment in domestic service, on trial, followed up by active selling to convert the rental to a purchase. It will answer many doubts and satisfy many hopes. It looks like good business. It is the kind of factual evidence that the industry has been waiting for, while it has been watching this interesting experiment in the development of domestic revenue. Manufacturers and sales managers should get some good tips on sales and policies from this article.

▶▶▶"RATES for selling"—an idea that we will be hearing more about from every angle from now on. C. A. Leland of Des Moines discusses this as part of the load-building problem, in an interview. It is a bit of sound thinking from the farming country that will bring a harvest wherever it is planted. When executives get interested in sales to the degree of making rates to get business manufacturers can do the follow up.

▶▶▶BUT why go on. In news, in the departments, in the advertising there is reflected the same idea. Something new, something salable, something to use to advantage. These are the reasons why ELECTRICAL WORLD is published and *read*.

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PAPER CABLE
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This development is new to the extent that the paper tapes instead of being impregnated with an insulating oil are treated with Pyranol, which is a flameproof, synthetic, insulating compound.

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Pyranol volatilizes at arc temperatures, but the gases produced are nonflammable. In fact, it is an effective fire extinguisher in both its liquid and volatilized forms, and tends to snuff out any combustion.

A leaflet is available which describes briefly the characteristics of Pyranol. We should like to send you a copy. Ask for GEA-1886. Address the nearest G-E sales office or General Electric, Dept. 6-201, Schenectady, N. Y.

Service to You on Network Cable

For the last five years, G-E engineers have been studying insulated cable for use in networks. The information they have acquired should be useful to power-company engineers. They have also developed several other types of network cable for various applications, and these might be suitable for some of your requirements. We invite you to call in one of our cable specialists to assist you on your network problems. Address the nearest G-E sales office.

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ELECTRICAL WORLD

MANAGEMENT · ENGINEERING · OPERATION · UTILIZATION

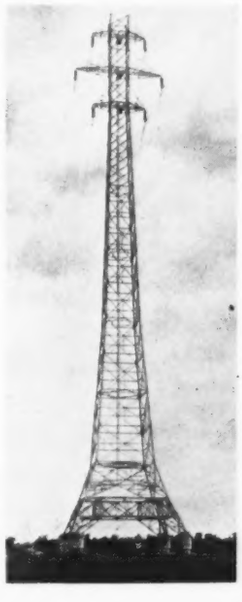
PUBLISHED EVERY OTHER SATURDAY

NOVEMBER 10, 1934

The Hour of Decision

BUSINESS is now fully conscious of the decision it faces. It appreciates the changed situation in Washington whereby the President, Mr. Richberg and the NRA board cordially invite business to step forward, inspired by the profit motive, and do the work required to bring full recovery. Some one must lead the way. In characteristic fashion Henry Ford has already committed himself to a recovery business venture of major magnitude. He is a leader in business. But the electrical industry has a larger opportunity and even more necessity to go to work for recovery.

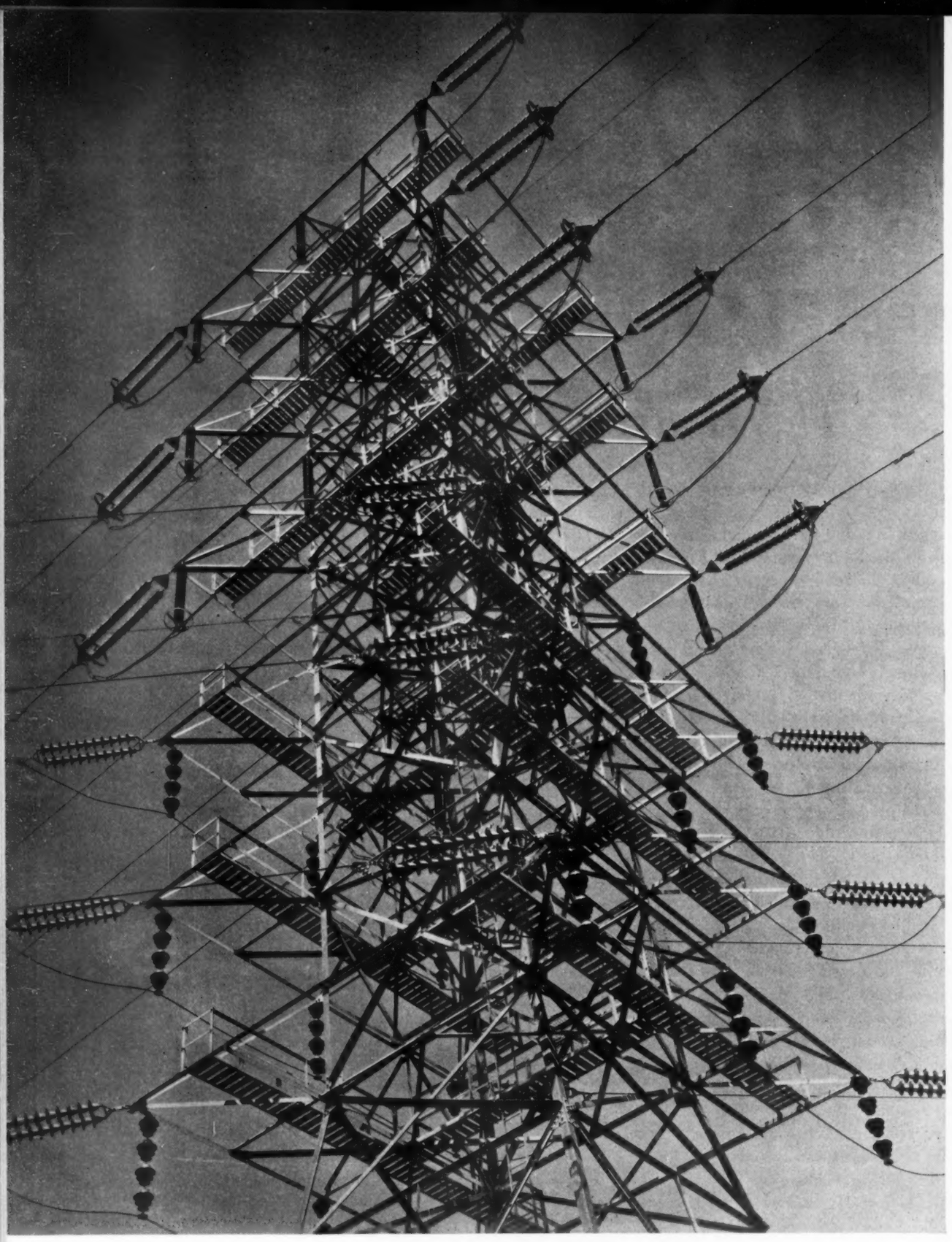
It has the organization, the money, the manpower and the products and services that can be sold. Each branch of the industry is a well-knit and harmonious unit. The public and industry are receptive to the idea of American electrification. All that are needed is leadership and a plan that will focus the industry as a unit upon a large sales promotion and marketing program. For example, the American home is the center of interest and attention. The Administration and the electrical industry are promoting home electrification, which is essential to more comfortable and convenient living. Why not organize a two-year drive to electrify the 19,000,000 homes now served? What greater market can be visualized? Business salvation for all branches rests in doing this task rapidly and in volume instead of maintaining the present spot market approach with single product selling.



The public is ready to accept the home electrification idea. It ties into the federal housing program and the home loan program. It lies back of the T.V.A. and other government projects. National promotion of the idea is already responsible for large increases in appliance sales. But the electrical industry has not grasped this opportunity in an organized way. It has capitalized upon this promotion in village trickles instead of national surges.

THIS business must be done on a national basis. Like the sale of cameras, automobiles, bathrooms and silk stockings, it requires an intelligently conceived and adequately supported national plan for the creation of demand with a well-organized local follow through for promotion, distribution and sales. It takes more than promotional rates and low-priced appliances applied locally, although these are necessary. It takes the Refrigeration Bureau amplified to a national home electrification basis, with utilities, manufacturers, wholesalers and dealers tied into a business plan for action in each locality. This project necessitates taking a business chance on results. It means striking for 2,000 kw.-hr. per customer, 2,000,000 refrigerators and 1,000,000 ranges and water heaters, for example, instead of the small increments in energy and product sales now recorded each year. This should be a national and well-publicized recovery drive, sponsored by the electrical industry so that all possible promotional aids will be brought to bear.

As a start, industry executives of all branches should get together with the best sales and promotional talent available to draw up policies and plans. Uniform and effective organization requires national and regional committees, practical sales promotion programs, definite local marketing and merchandising practices energized from the top down and a unified application of all the elements needed for success. There now exists a golden opportunity to electrify American homes. The electrical industry should seize it and thus lead the way to recovery.



HIGH-VOLTAGE LINES PIONEERED IN CALIFORNIA

The new 287,000-volt Boulder Dam line is the latest step in pioneering high-voltage lines in California. An unusual combination crossing tower with two 220-kv. lines of the Southern California Edison Company and two 132-kv. lines of the Los Angeles Bureau of Power and Light shows the proved capacity of California engineers to solve transmission problems.

Who Will Use Boulder Power?

Operation to Begin in 1935 — Time Elements and Magnitudes Involved — Effect Upon Local Utilities — New Scale of Engineering and Design for Stations and Lines

IT IS thought that Boulder Dam will begin operation in September, 1935, so rapidly has construction been done. It is opportune, therefore, to review the features of this large project and to give views of accomplishments. The firm power development is estimated at 4,300,000,000 kw.-hr. annually and the secondary power at 1,550,000,000 kw.-hr. annually. The government does not generate the electricity, but sells the falling water at 1.63 mills per kilowatt-hour for firm power and 0.5 mill for secondary power.

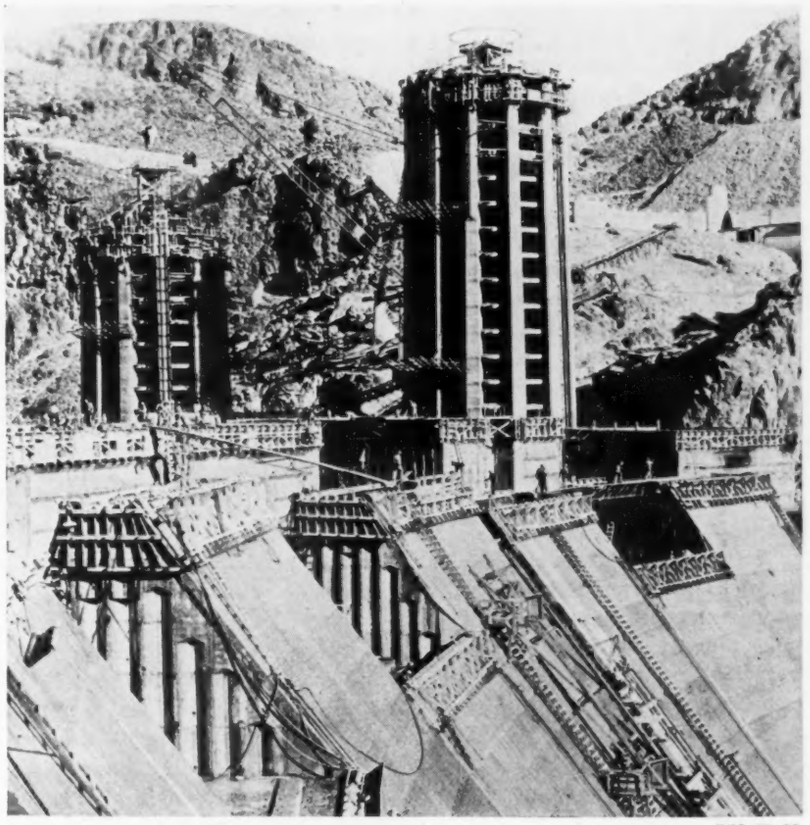
The government is building and will pay for the power house. It is also installing and paying for the generating equipment, which will be leased to the generating agencies for a period of 50 years and will be paid for by the generating agencies in ten annual installments, beginning when the equipment is ready for service, deferred balances carrying an interest charge of 4 per cent.

The power house consists essentially of two parts, one on each side of the stream, connected by a gallery across the foot of the dam. The Nevada side station is to be utilized by the Metropolitan Water District and the city of Los Angeles, the latter acting as generating agency for itself, Pasadena, Glendale and Burbank. The Arizona side station is to be utilized by the Southern California Edison Company and the Southern Sierras Power Company, the latter acting as generating agency also for the Los Angeles Gas & Electric Corporation. It is estimated that the buildings will be completed and one unit ready for operation in each station by September, 1935.

Allocation of the firm power to the several contracting agencies, in percentages, is as follows: Nevada 18, Arizona 18, Metropolitan Water District 36, Los Angeles 14.9054, Pasadena 1.6183, Glendale 1.8867, Burbank 0.5896, Southern California Edison Company 7.2, Southern Sierras Power Company 0.9, Los Angeles Gas & Electric Company 0.9. In addition to the above the city of Los Angeles has contracted for another 90,000,000 kw.-hr. that will be available by reason of the increase in the height of the dam. If Nevada and Arizona do not take their allotments, and no move has been made in this direction, they will be split between the city of Los Angeles and the Southern California Edison Company.

One of the world's largest reservoirs, it will have a capacity of 29,500,000 acre-feet and 10,000,000 acre-feet of stored water will be necessary before generation begins. At present two generators, each 82,500 kva., and one bank of transformers and switches have been ordered by Los Angeles and one 40,000-kva. generator with necessary transformers and switches for the Southern Sierras Power Company. Others will be ordered as needed.

Operation by the city of Los Angeles will begin as soon as there is sufficient water storage, and the Southern California Edison will begin, according to the contract, three years after the city starts. An estimate of the amount of firm power the city is obligated to take and pay for, assuming nothing for Nevada and Arizona, is 429,000,000 kw.-hr. the first year, 953,000,000 kw.-hr. the second, 1,185,000,000 kw.-hr. the third, 1,317,000,000 kw.-hr. the fourth and 1,648,000,000 kw.-hr. the fifth year. The obligation of the Southern California Edison Company, three years after the



Wide World

Boulder Dam nears the three-quarter mark

city starts, in per cent of the contract maximum is 55 per cent the first year, 70 per cent the second, 85 per cent the third and 100 per cent the fourth. Thus it will be seven years after the city starts that this company will take its contract maximum of about 900,000,000 kw.-hr. As soon as the city can do so it will divert the present load which the Southern California Edison Company has been carrying, some 450,000,000 to 500,000,000 kw.-hr. per year, but will pay the Edison Company $575,000 annually as standby service from Long Beach so long as existing capacity is inadequate to meet the combined needs of the two parties.

Present power consumption in southern California is about 4,000,000,000 kw.-hr. annually, of which 3,000,000,000 is produced by the Southern California Edison Company. Since Boulder Dam power cannot be used immediately both load growth and a shifting of present supplies can be brought into play to assist in meeting the situation. It is hoped that a general improvement in business, more sales and a further influx of population will absorb the bulk of the power, and there is some possibility of shifting power from Big Creek northerly and absorbing an equivalent of Boulder power.

Status of line and stations

Los Angeles, Pasadena, Burbank and Glendale have entered into a contract for joint transmission of their power to a central receiving station in Los Angeles. The line now building consists of two circuits at 287,000 volts, the equivalent of three 220,000-volt circuits, and provision is made to add another circuit to the line. Each circuit will be 270 miles long and the two will have a capacity of 240,000 kw. There will be two intermediate switching stations on this line and at the receiving end the step-down is made to 132,000 volts for delivery to central receiving stations.

The total estimated cost of this installation is $22,800,000, allocated as follows: Transmission $13,700,000, intermediate switching station $2,000,000, step-down station $1,000,000, receiving station apparatus $4,400,000 and a supplementary line to another receiving station $1,700,000. This money was borrowed from R.F.C. as a self-liquidating loan to be paid out of power sales.

In the lightning section the line is built as two separate single-circuits, the tower lines being parallel and 265 ft. apart. At a point west of Cajon Pass these lines converge into a single-tower, double-circuit line. Twenty-four suspension units, 10 in. in diameter and spaced 5 in. apart, are used. The horizontal spacing of conductors in the single-circuit towers is 42 ft. 6 in., the height from ground to crossarm 90 ft. and to top of tower 109 ft. Overhead ground wires and a double counterpoise are provided for lightning protection. The tower type is of the narrow-waisted rotated base design. Each standard single-circuit tower weighs about 18,000 lb. and is designed to withstand one broken overhead wire, one broken conductor, $\frac{1}{2}$ in. of ice radially and 8 lb. of wind pressure on the projected surface.

Double-circuit towers have the two circuits in a vertical plane. The distance between circuits is 40 ft. with a vertical spacing of 24 ft. Height from ground to lower crossarm is 75 ft. and to the top of the tower 144 ft. Each tower weighs about 23,000 lb. and is of conventional design. Towers are designed for wind load of 20 lb. per square foot on one and one-half times the net projected area on one face of the tower. Loading design on these towers assumed one broken ground wire and one broken conductor on the same side of the tower and also a wind load equivalent to 70 miles per hour. Tower footings are chiefly of reinforced concrete with uplifts figured on a 30 deg. cone basis. The conductor chosen has an area of 512,000 circ.-mil and is of the new hollow segmental tongue-and-groove construction made by the General Cable Corporation.

Intermediate switching stations are at about 90-mile intervals and sectionalize the line into three parts. Each station requires four 287,000-volt oil breakers of interrupting rating of 2,500,000 kva. and the new type General Electric breakers will be used. The step-down transforming station at the receiving end will consist of two banks and a spare, each rated 195,000 kva., with a two-hour overload rating of 240,000 kva. Four 60,000-kva. synchronous condensers will be installed at the receiving end of the line. Much of the line and equipment is purchased and under construction at this time.

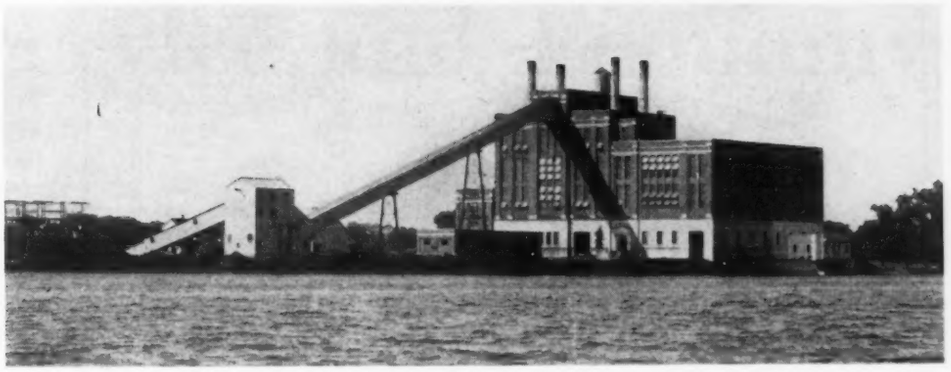
Absorption of this large block of power appears feasible because of the time element involved. The effect on the southern California private and municipal utilities is to promote aggressive load building and postpone the construction of additional generating capacity. Station, lines and substation embody many new ideas and much new equipment that will advance the art. But the major conclusions as to the economics of the project are yet to be determined. The large investment in station, the long transmission line and its cost, the cost of service reliability appear to put a high cost on delivered firm power. With present levels of fuel station prices and enormous supplies of low-priced gas and oil equivalent power should be capable of production at the load for under 4 mills at local fuel-burning station busbars.

Surplus embarrassing at present

At the present time the prospect of Boulder power is in the nature of an embarrassment to all the power systems, for the population and business increase in the territory has been less than was anticipated when contracts were signed—due to economic conditions, of course. There is considerable surplus power capacity already in the territory and utilities will be hard put to find a market for the "bargain" kilowatt-hours. Undoubtedly the utilities will introduce rates to dump the surplus and make an intensive drive on cooking, space heating, water heating and industrial use.

The political atmosphere is not very good and the recent city election in Los Angeles gave the bureau power to borrow money to purchase the properties of the Los Angeles Gas & Electric Corporation and also to go into any legitimate business "either inside or outside the city or state." This phrase indicates some idea of ambitions to create another T.V.A. in this section on a greater or smaller scale. It is also interesting to note that Pasadena, with its contract for 68,000,000 kw.-hr., has asked Secretary Ickes to hold off the full amount for three years. Glendale has asked for a five-year delay and Burbank for a seven-year delay. The plea is to permit of a load development period to use the power.

The final answer on Boulder power and its use must wait upon final costs and returns and the development of markets. At present the utilities concerned are optimistic that the situation will work out satisfactorily. It must also be remembered that power is only a part of this great project that is planned to benefit the entire region.



Riverside station across the Mississippi

Spends on Boiler to Save on Fuel

Pulverized Fuel Firing With Slag-Tap Furnace Uses Nearby Coal and Raises Boiler Output

REDUCING the unit fuel cost of a boiler 25 per cent by making an investment that the fuel saving will retire in 2½ years is pretty good business. When the same investment also raises the steam production 25 per cent, then it looks like very good business indeed. In general terms, this was what was done with boiler No. 3 at the Riverside station of the Riverside Power Manufacturing Company, which supplies bulk energy to the Tri-Cities (Moline and Rock Island, Ill., and Davenport, Iowa). Since the change was made the estimates of economy have been abundantly proved by the operating experience of more than a year.

Riverside was built about nine years ago. It contains two 20,000-kw. turbo-generators and four 1,044-hp. boilers, nominal rating. The boilers were equipped originally with underfeed stokers designed to burn southern Illinois coal, which has a heat content of 11,000 to 12,000 B.t.u. and a reasonably low ash percentage and high ash fusion point. With this equipment and this fuel Riverside ground out kilowatt-hours for more than eight years, consistently showing the economy for which it had been designed, and no one had any fault to find with its performance. Then an enterprising fellow kicked the top soil away in a field near Atkinson, Ill., and uncovered a strip coal mine.

Southern Illinois coal for Riverside has a freight charge for about 200 miles added to its mine price. Atkinson coal is available at a higher mine price, but has to be transported only 30 miles. The Atkinson coal cost in the power house yard is about 75 cents per ton less than that from southern Illinois. If the two coals were the same in characteristics and quality this article would never have been written. The purchasing agent would just have performed his purchasing duty. But the coals are quite different; the Atkinson fuel, while of fairly high heat value (10,700 B.t.u.) has an ash characteristic quite different from the other. The ash from the Atkinson coal is quite fluid at a low temperature.

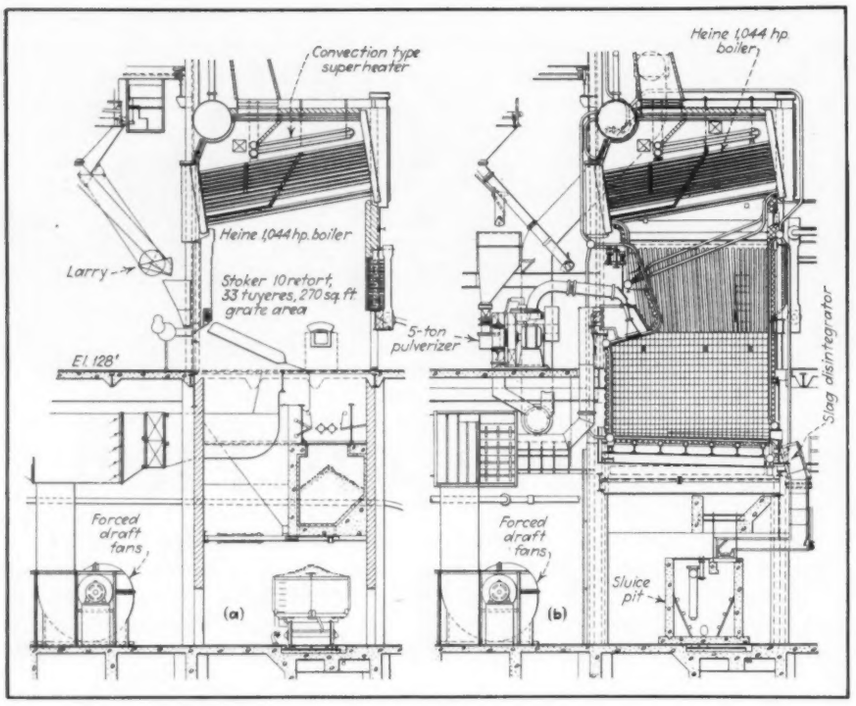
By G. T. SHOEMAKER

Vice-President United Light & Power Engineering & Construction Company, Davenport, Iowa

This is due to a fairly high percentage of iron sulphide and no doubt accounts for the acute indigestion that afflicted the underfeed stokers when the Atkinson coal was fed to them. It was quite plain that continuous use of this coal would make stoker maintenance amount practically to continuous stoker replacement. Also, the dependability factor of the stoker was reduced to the point of interference with continuous plant operation. Obviously, a choice had to be made between the fuel and the method of burning it.

It was decided that one of the four boilers would be revised to try out another firing method. At first the other method was contemplated to be a chain-grate stoker, which is generally accepted as a good performer with difficult coals. In fact, there were plenty of record data available in the engineering organization responsible for Riverside to show that good results could be obtained from the Atkinson coal on a chain grate. But why be satisfied with good results when it might be possible to get better ones? Experience elsewhere with powdered coal and slag-tap furnaces indicated that very probably this combination would beat a chain-grate stoker with fuel of the particular Atkinson mine characteristics. It was decided that the first boiler changeover at Riverside would be to pulverized fuel and a slag-tap furnace. If this installation did not pan out well, then chain grates could be used.

The underfeed stoker and the entire



Before and after

This sectional drawing shows how (a) the lower row of tubes in the original Heine boiler was dropped down to make a slag screen and (b) the combustion chamber was deepened for the downward sweeping powdered coal flame.

furnace were removed from under boiler No. 3. The slag-tap furnace was extended downward below the previous furnace floor to provide the necessary combustion space for the vertical firing of pulverized fuel. Bailey water walls and floor were included in the furnace. The boiler itself—a Heine—was not changed except that the bottom row of tubes was removed and new bent tubes, looping down into the furnace, installed to act as a slag screen. The boiler, as rebuilt, is designed for steam production of 140,000 lb. per hour for from one to four hours and for 120,000 lb. per hour continuously. The steam pressure is 410 lb. gage at the superheater outlet and the total temperature 720 deg. F. Continuous steam output of the boiler before conversion was 96,000 lb. per hour. This means, as was earlier stated, that the change resulted in about a 25 per cent increase in capacity over the original condition. The only result that did not come up to expectations was steam superheat temperature, which, with pulverized coal firing, was about 20 deg. short. This is due, no doubt, to the large amount of water-cooled surface in the furnace. The slag-tap furnace, tapped once every 24 hours, has worked out exceptionally well and has given no trouble at all.

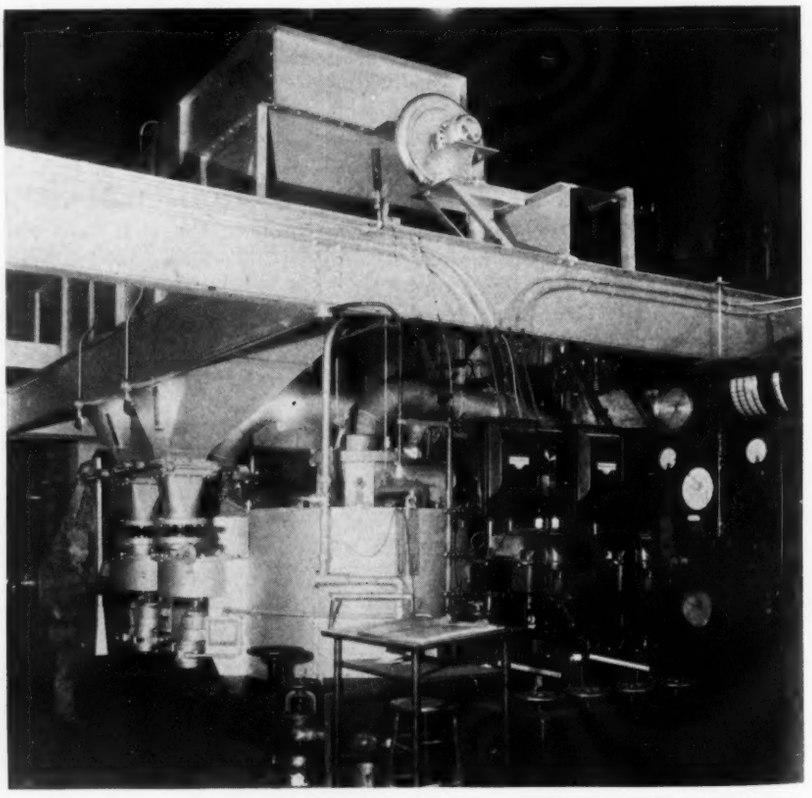
The change was made in the fall of 1932. The boiler operated through the year following fully realizing its performance estimates. Then, in the summer of 1934, natural gas from a Texas pipe line became available at a favorable price. The pulverized fuel burners were adapted to gas burning. For several months now the plant has been using gas as principal fuel. However, the pulverized fuel installation is kept in operating condition as a reserve ready for instant operation if the gas supply should fail. Also, the availability of gas as a power house fuel at Riverside depends entirely upon the total of other demands on the pipe line and it may be necessary to return the power house to coal firing on short notice.

A practice changeover from gas to coal and back again was recently made, and although no effort was made to establish a speed record it was found that the changeover can be made very quickly; that a mill can

[*Continued on page 78*]

Results from Changing to Powdered Coal

	Before	After
Boiler rating, nominal (hp.)	1,044	1,044
Coal used, B.t.u. content	11,500	10,700
Ash fusion—deg. F.	2,200	1,000 to 2,000
Steam output, lb. per hour, cont.	96,000	120,000
Steam output, lb. per hour, forced	110,000	140,000
Steam pressure, lb.	410	410
Total steam temperature, deg. F.	740	720



Double mill, unit pulverizer installation *Babcock & Wilcox*

System Service and Economy

Survey of the Latest Ideas and Practices in Distribution Show New Developments — Opinions and Methods Vary Greatly — Many Opportunities for Improvement Suggested

DISTRIBUTION equipment and practices are receiving major attention by engineers and manufacturers. Every possible endeavor is being made to improve service and reduce costs. Overhead distribution, especially that devoted to serving residential customers, is being rebuilt and changed because of the new demands that have been made on loading and on service standards.

To focus attention on this situation a survey of utility opinions and practices has been made by ELECTRICAL WORLD and the replies are published in this article. It is evident from these replies that great attention is now being given to overhead distribution and that many opportunities exist for both utility engineers and manufacturers to reach agreements, to produce better equipment and to standardize on equipment and practice. These questions and answers afford the background for a great advance in overhead distribution.

1. The best way to improve service.

Replies separated by semi-colons.

Use overhead secondary network and voltage regulators; protect against storms; locate primary lines to be free from interruptions and co-ordinate branch fuses to isolate faults properly; improve local transformer installations with secondary and service lines; make refinements in construction; make more frequent inspections to clear trees, recheck sags and test equipment; improve voltage regulation and give special attention to the secondary plant; make inspections of transformer fuses, use more regulators, put in heavier secondary copper, use larger transformers than 5 kva.; improve transformers and secondaries; overhaul all distribution for better equipment and construction; use rapid reclosing breakers and get better voltage regulation by changing distribution design; use a well-planned protective system.

2. The best way to reduce costs.

Replies separated by semi-colons.

Reduce the number of transformer installations to a minimum, using larger sizes to replace several smaller, and apply voltage surveys as a basis for eliminating small secondary copper on old sections; cannot reduce costs and improve service at the same time; simplify the types of construction; standardize construction and size and loadings of substations; give close attention to small maintenance items; make a proper scheduling of plant maintenance; save in transformer and secondaries; rearrange the copper and get rid of many poles, use lighter construction for light loads, use bare wire instead of weatherproof; use bare wires, interconnect transformer neutrals, reduce size and setting of poles, combine primary and secondary neutral.

3. How do you load transformers?

Each sentence is a separate reply.

We load to 150 per cent during short winter lighting peaks for residential transformers, 125 per cent on commercial; use no telltales, but all transformers are felt out on mild winter night and hot ones are then tested, after which average load per customer data are applied; on commercial a clamp ammeter test is used. We do not use temperature loading because this results in poor regulation. We find the most satisfactory way is to feel out with the hands during maximum load periods on the transformers. We permit 25 per cent overload on overhead transformers, but no overload on underground; we are using "Thermotels" on many transformers. We load residential transformers so that, at the peak, they will have 160 per cent of rating, but industrial and commercial are limited to 100 per cent; we use spot ammeter readings with slip-over transformers to test loading. We use overload on peaks, but use voltage regulation as indicator for loading. We use 125 per cent average load on peak with Thermotels to check values.

We load transformers to the limit, using Thermotels and maximum demand ammeters. We load to the limit after testing with curve-drawing ammeters. We do not load transformers to the limit and have found no satisfactory telltale devices; depend upon use of portable meters. Our transformers are not changed until Wright demand indicator shows a 50 per cent overload; we use connected load data on transformer cards to indicate transformers to be tested. We load our transformers initially to 90 to 100 per cent of rating and continue them in service up to 150 per cent at the seasonal peak; all units 15 kva. and above have thermometers with direct reading pointer and maximum demand targets, readings being taken four times each year. We load some to 175 to 200 per cent, but most average about 130 per cent; we use split-core transformers for load tests and get load direction at the same time.

3a. What standard sizes of transformers do you use and what ratings are you working toward?

Each sentence is a separate reply.

We are using smaller sizes of old transformers, but are now purchasing only 10, 15, 25, 37.5, 50, 100, 150, 200-kva. units and are trying to go to larger sizes. We use all sizes for greater economy. We use N.E.M.A. standards, but nothing less than 2.5 kva. We have discontinued use of 1.5 kva. and are using 3, 5, 7.5, 10, 25, 37.5, 50, 75, 100. We are using N.E.M.A. standards from 1.5 to 200 kva. inclusive. We use N.E.M.A. standards. We now use 5, 7.5, 10, 15, 25, 37.5 and 50 kva., but are concentrating on 15 and 25-kva. units.

We are not contemplating any change in our present use of 1.5, 3, 5, 7.5, 10, 15, 25, 37.5, 50 and 75-kva. units. We recently surveyed our sys-

tem and made a voltage survey and as a result are eliminating many sizes; we will use 2.5, 5, 7.5, 10, 15, 25, 37.5 and 50-kva. units. We see no object in standardizing on fewer sizes on a large system and use them all. We now use 1, 1.5, 2, 2.5, 3, 4, 5, 7.5, 10, 15, 20, 25, 37.5, 50, 75 and 100-kva. units, but propose to use only 3, 5, 7.5, 10, 15, 25, 37.5, 50, 75 and 100-kva. units. We are making no effort to standardize on fewer sizes and use all ratings from 3 kva. up. We use all except 1.5, but very few of the 3 and 7.5-kva. units.

4. Should transformers have automatic reclosing circuit opening device on primary and secondary and also be self-protecting?

Each sentence is a separate reply.

We believe this would tend to reduce prolonged outages, though not quite in accord with placing such equipment inside the transformer; have purchased some Type CPS Westinghouse units for trial use. We believe that secondary breakers (not reclosing) have many advantages. We believe in heavily fused primaries, self-contained manually closed secondaries and self-protection. If a transformer is self-protecting, it does not seem that there is much need of an automatic reclosing device on the primary and we do not favor such a device on the secondary unless parallel operation is contemplated; we are interconnecting arresters and fusing to clear defective transformers without opening line fuse and if we install a reclosing device on primary it will be on branch line, not transformer.

We have not used any of the new opening devices on primary or secondary and we are continuing the use of separate lighting arresters rather than the so-called self-protecting transformer. We believe the suggestion has much merit, but have not done anything along this line since the law prohibits interconnection. We believe a prompt reclosing device on the primary is desirable, but are not so sure of secondaries; we have tried reclosing primary fuses and so-called flip-ons on secondaries, but abandoned the use of the latter. The idea is fine if the cost is not prohibitive, but we have done nothing along this line.

Such of the automatic reclosing devices built within the transformer that I have seen are weak mechanically and electrically, principally mechanically, and I doubt very much if such a device is worth while. We believe that automatic reclosing equipment on primary and secondary of transformers is unnecessary and will probably cause more trouble than it will prevent. The idea is good, but the cost is probably prohibitive; we have purchased some Type CPS Westinghouse units for trial use. We are not seeking any reclosing device on primary side; in fact, we are doing away with primary fuses in many instances; we are interested in the development of the new secondary breaker and have purchased some of these as well as surge-proof types, as well as practicing interconnection of arrester and secondary grounds; on a recently built line we put in a single primary fuse for all short branch lines that had five to ten transformers and a reclosing fuse was installed at the point where the branch tapped off the main circuit.

We do not believe these attachments necessary and they will detract from service; the present transformers give wonderful performance and primary fuses do a good job; with transformer failures at 1.5 per cent per year, the average is 66 years of service without trouble and we cannot conceive of any mechanical device lasting that long.

5. Do you use pole-mounted regulators or reclosing circuit devices?

Each sentence is a separate reply.

We are considering the use of pole-mounted regulators for some long circuits, but now use station type; automatic reclosing fuses on customer premises will cut down outage time and warrant investment costs. We use these devices, they are a step in the right direction. We are going to 13.2 kv. to get away from substation regulation. Pole-mounted regulators and circuit-breaking equipment is a step in the right direction; we use conventional regulators in metal houses on poles, but undoubtedly will use factory-built equipment in future. We believe in the use of these devices, but have not used any extensively as yet.

We think these devices are justified, particularly for thin business, but have not yet found them necessary because of good transmission regulation. These devices are essential for long lines, but we prefer station regulation for short lines in dense areas. We use these devices. We are putting in regulators at substations and are equipping all breakers with reclosing relays. We use both devices and find them necessary in scattered areas. These devices are all right for rural areas, but are not necessary in congested sections.

We see no need of pole-mounted, circuit-breaking and reclosing equipment, although we are installing a new tap-changing auto-transformer type of regulator on a 12-kv. rural circuit. We use both on rural lines, but do not use in urban areas, although we would use reclosing or repeater fuses in place of oil switches where installed outdoors.

6. Are you using bare wire to any extent?

Each sentence is a separate reply.

Rural lines only. Rural lines. We are going to bare primaries, both rural and urban, but bare secondaries for rural only. We use bare wire primaries outside city limits and have several hundred miles of bare conductor rural lines. We use bare wire primaries for rural. We use bare wire on all new work and on much of rebuilding work. We use bare primary wire when tree conditions permit. We do not use. We do not use bare wire. We use bare wire in rural areas where ordinances permit. We use bare aluminum and copper on rural. We use bare wire almost entirely for primaries and secondaries and save in first cost and use longer span construction. We use bare wire in and outside cities, boroughs, etc.

7. Have you adopted stricter weatherproof wire specifications?

Replies separated by semi-colons.

Use Purdue specifications; yes; no; yes; not yet; they are being drawn; no; purchase under Utilities Research Commission specifications; yes; no; buying under Utilities Research Commission specifications; yes; modified Utilities Research Commission specifications (without slate and greater tolerance on weatherproof covering), but will probably go to double braid instead of triple.

8. Do you make cable connection from underground to pole transformers?

Replies separated by semi-colons.

Only where we have back-lot construction from underground feeders; no; not so far; not extensively; we make cable connections directly from underground primaries to pole transformers, but install cable terminals on the transformer pole and connect through fuse boxes to the transformer, no arrester being installed, and these save the cost of a manhole and a more expensive line transformer; we are in-

terested in using cables on secondaries to reduce line resistance, but find cost excessive; no; no; not to date; no; no; no; in a few cases where water bothers transformers we mount them on poles to feed back into the underground system; no; occasionally in inaccessible locations as this saves the cost of a vault.

9. Do you use overhead cables for primaries to any extent?

Replies separated by semi-colons.

No; yes, in group construction using single conductor; no; use some aerial cable on 11-kv. transmission; use single-conductor, lead-covered on messengers for bridge underpasses, etc.; no; no; no, but trend is in this direction where heavy trimming is impossible; no; no; no; no; in special cases only, use "Kerite" and some rubber and lead covered.

10. Where do you use arresters and how located

Replies separated by semi-colons.

At all transformers above 2.5 kva. on transformer hanger arms; on all transformers 7.5 kva. and larger, using the interconnection scheme; on all new work. interconnected scheme; on all transformers and cable risers to overhead lines, interconnected scheme except in rural areas; at all transformers and cable terminals with connections ahead of primary fuse at all transformers; on all cables and at outgoing feeders in stations only; on each transformer with interconnected scheme, but are considering going to spill gaps in place of arresters; on all above 5 kva. in rural and a few for line chainage, but protect only large banks in urban areas, no interconnection; at all transformers, no interconnection; on all transformers 12 kva. and larger and at exposed locations; in rural all 3 kva. and above, but in city on 5 kva. and above and where ranges are served; on all transformers ahead of primary fuse, interconnection scheme; on all transformers on line side of fuse, interconnection scheme except where water pipe ground is not available, in which case use 10,000-volt gap between arrester and neutral.

11. What is the trend in substations—many small—a few large—factory built?

Each sentence is a separate reply.

We standardize on 7,500-kva. outdoor types 33,000/4,100 volt with six outgoing feeders and think the factory-built idea has a lot of merit. Factory-built idea may be ultimate solution, but price will be a hindrance. We undoubtedly will go toward a large number of small substations, probably factory-built idea, with the idea of developing a primary network, and have already purchased one unit whose performance will guide our future. We trend toward small substations, but have not tried the factory-built units. Small substations show economy, but have not yet used factory-built units. We prefer a number of small substations, using as much high-voltage line work as possible, but have no experience with the factory-built idea.

Use many small substations and like the factory-built idea. Factory-built substations are advantageous, but have not used them. We are fully sold on a large number of small substations as compared with our old practice and try to make a proper balance between subtransmission, substations and distribution; we like the factory-built idea. Conditions vary too much for general conclusion, but trend toward more and smaller automatic substations makes for economy and service; the factory-built idea is splendid in its proper place and should have wider use at present.

12. What new equipment, construction or operation have you introduced recently to improve service or reduce costs?

Each paragraph is a separa'e reply.

(a) Changed from single-phase underground network transformers to three-phase type, thereby simplified vault wiring and reduced costs somewhat. Going to use photo-cell control on new street-lighting contract to replace station and time switch control.

(b) Using 440-volt meter protection. Using spill-over gaps on 12 kv. Using ground relaying. Installing rapid reclosing breakers.

(c) Using outdoor type primary network unit of 1,500 kva. with two outgoing feeders.

(d) Going to low-voltage a.c. network in one area. Are going to dispatching of switching on 4-kv. lines. Focussing on construction economies in poles, wires, arms, etc.

(e) Have put in a new three-phase manually operated step-voltage regulator.

(f) Putting in automatic reclosing. Improved relays on transmission. Put on a voltage survey crew and found startling things—principally that more regulators are needed and more secondary copper. Going to three-wire service even in small towns. Our survey shows that 110 volts is the proper lamp voltage despite our previous impression of 115. I believe the industry has been kidding itself as to the voltage for customers' wiring and lighting purposes.

(g) We have reduced costs most by eliminating weatherproof wire and by using suspended secondaries in which the grounded neutral conductor is of copperweld, capable of supporting considerable load, and by making the most of primary branch lines, that will probably remain single phase for a number of years. We use a single ridge pin primary conductor with the other primary conductor mounted on the side of the pole as the grounded neutral primary, later to become also the secondary neutral as well as the supporting messenger for secondaries.

(h) Use advanced secondary design; pole top regulators on rural lines; repeater fuses on rural lines. lower impedance transformers; bare wire in cities; universal fuse links; auto-transformers on secondaries; steel corner pins; better treated pine poles; lower class of poles, interconnection of arrester and secondary neutrals; medium loading design of rural lines; common neutral for primary and secondary.

13. What suggestions have you for the development of new equipment or the improvement of existing equipment?

Each paragraph is a separa'e reply.

(a) Lower impedance and change of loss ratio in distribution transformers; a real universal fuse link.

(b) Lower cost multiple step-voltage regulators; trip-out primary cutouts still need improvement.

(c) Further standardization of materials, transformers, arresters, etc.

(d) Development of a cable suitable for secondary distribution that could be installed without a messenger and tapped simply; low reactance installations to reduce lamp flicker; more use of auto-transformers to reduce voltage fluctuations.

(e) A quick-reclosing oil breaker that would restore service before a motor would drop out.

(f) Continue development of primary cutouts; none of those offered are very good and there is a great field for further improvement.

(g) We need a good automatic reclosing fuse. Reduce the investment per kilowatt of distribution lines.

High-Speed Reversing Drives

With machines having a cyclic duty it has long been recognized that if the return movement after a working stroke could be speeded the productive capacity of the machine could be increased. For heavy-duty production, demanding accurate control and ruggedness, electrical methods have great advantage over mechanical. The author, whose position fully qualifies him to discuss the subject authoritatively, relates four steps in the development of the high-speed reversing drive now used by his company, and suggests the direction future development may proceed. His discussion deals with a subject which concerns many factory superintendents, and electrical engineers, industrial consultants and utility power salesmen who in helping their customers adapt themselves to a highly competitive situation may expect increased business in return.

By H. S. STEWART
Electrical Engineer
Crane Company, Chicago.

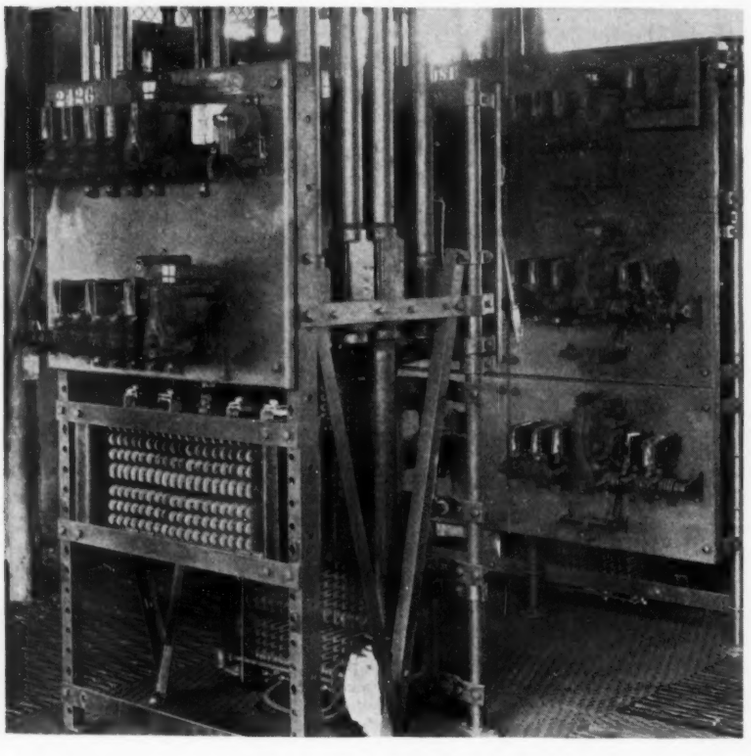
IN ALL production-machine operations that are non-continuous, that are cyclic in nature, it has been obvious from the beginning that production could be speeded up if the time of return movement of the tool could be shortened. At first the solutions offered for this problem were mechanical, often being built into the machine itself, and sometimes simply providing means for shifting belts from forward-drive pulleys to others running at higher speed in the reverse direction. Recognition of the problem and examples of its mechanical solution can be observed in machine designs dating back to the early '70s of the past century.

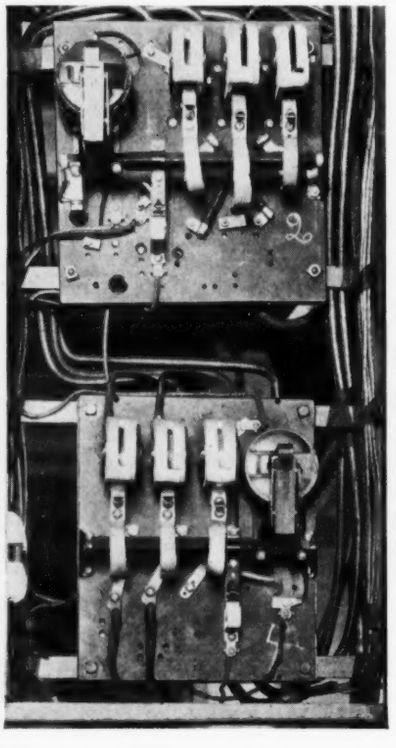
In modern machine-tool design the principle of the fast-return movement is a feature so common as not to excite any particular notice, be it either mechanically or electrically accomplished. However, for big machines of very high production capacity fast tool return becomes a matter that cannot be handled well mechanically and must, of necessity, be treated as an essential part of the electric motor drive.

In the Chicago plant of the Crane Company are a number of heavy-duty, high-speed, multiple-tool machines used for inside and outside threading of many shapes and sizes of pipe fittings. For a typical machine the working cycle requires a forward drive for an appreciable length of time while the taps or dies are cutting the threads, then the tools must be backed off the finished pieces and new work moved into place. Naturally production speed is an essential consideration in the operation of such machines and it was appreciated quite a few years ago that incorporation of the reversing function in the electrical drive was a logical development.

First methods used

The first installation of reversing motor drive made in the Crane plant consisted of an ordinary 35-hp., 600/1,200-r.p.m. squirrel-cage motor. This did the work, is still doing it, as a matter of fact, on the machine on





Control development for fast reversing drive

At the left is a view of some of the contactor panels for early installations. In the background is the control for one of the early two-speed slip-ring motor installations. Compare this with the much smaller contactor installation for the latest slip-ring, squirrel-cage combination at the right.

which it was originally installed. But it has certain deficiencies, from a study of which improvements incorporated in later installations were evolved. In the first place, the simple induction motor has insufficient radiating capacity to dissipate the heat generated by frequent plugging and acceleration. Also the reversing connections had to be somewhat complicated. If the backward and forward speeds had been the same, reversing would have been a simple matter of flopping a phase connection. But with the doubled backward speed each change in direction of rotation involved not only a phase reversal but also a reconnection of stator leads to change the motor from a six- to a twelve-pole machine and vice versa.

In view of the inability of the squirrel-cage motor to dissipate accumulated heat easily, the obvious cure was to use a motor that had external heat-radiating capacity. The next installations were therefore slip-ring motors. But the two-speed, slip-ring motor was hardly more satisfactory than the squirrel-cage; perhaps it was even less satisfactory. The reason was that the rotor resistance could not be handled as a fixed quantity, but had to be stepped for starting. This resulted in no great improvement in speed of the operating cycle over the squirrel-cage motor. It was clear that something better could be devised.

Two motors coupled

Consideration of the work cycle performed by the drive revealed that its demands were more than could be covered by the characteristics of a single motor. Therefore the next plainly apparent step in the development was to use two motors directly coupled together, one for the forward and the other for the backward rotation. It appeared reasonable to use slip-ring instead of squirrel-cage motors, using external rotor resistances to get rid of the heat of plugging and acceleration. Reversing thus became merely a matter of disconnecting one motor and connecting the other. In this arrangement each motor "plugged" the other; that is, each was energized after the other was disconnected, but while its rotor was moving contrary to normal rotation. Thus the rotor resistances of both motors were in alternate use.

Further analysis of the work cycle indicated that a better division of the work could be made by using a slip-ring and a squirrel-cage motor instead of two slip-ring. This combination resulted in a simpler motor installation and in a little more complicated control, but achieved a considerable improvement in operation. The wiring diagram shown on page 76 is a typical electrical layout of this kind. In operation the 30-hp. slip-ring motor which is used for reversing has the duty of plugging, or fast deceleration, on both the forward and backward rotations, as is shown in the characteristic work cycle graph.

Study of the wiring diagram reveals that the problem of control is not altogether a simple one. An essential requirement is that there shall be no over-run, particularly of the forward tool movement, because die and tap breakage and work spoilage would result. Therefore the forward movement must be stopped accurately and positively. This is why the plugging and reversing duty requires a motor twice the capacity of the forward drive—in this case a 30-hp. slip-ring coupled with a 15-hp. squirrel-cage motor. Details of the control are explained in the diagram caption.

There are definitely apparent directions in which lie the future development of the fast reversing drive. One is toward the reduction of weight and

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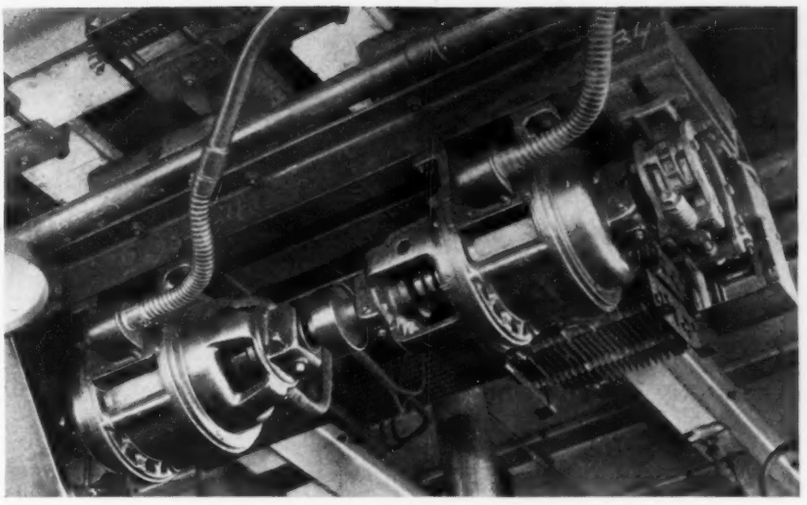
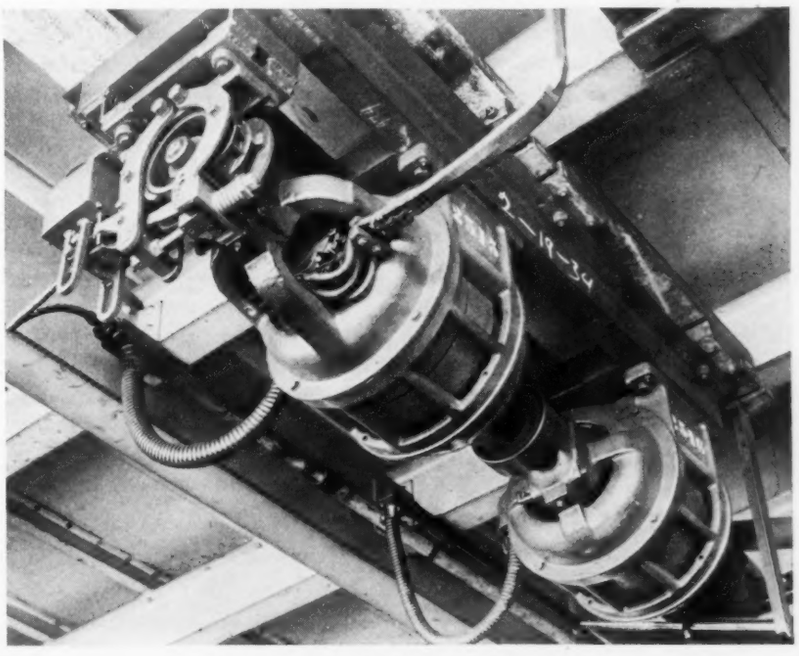


Forward and backward by slip-ring motors

Back of each motor, fastened to the ceiling, can be seen the external rotor resistances for dissipating the heat of plugging and acceleration.



Latest form of fast reversing drive

In the foreground is the reversing slip-ring motor with magnetic release brake on the end of its shaft.

Potentials From Insulators

Gradient Across Grounded Unit, With Thermionic Valve, Provides Line-Voltage Pilot and Synchronism Check

By J. W. GRAFF . . . J. T. JOHNSON, Jr.
Operating Engineering Department, Alabama Power Company, Birmingham

Centralization of load-dispatching authority may work to delay restoration of service after a system separation. Alabama speeds up the restoration by letting operators at primary stations re-energize or resynchronize on certain lines without first communicating with the load dispatcher. But a pilot indication is necessary, and this is afforded by a new potential device which for these purposes is substantially less costly than potential transformers, capacity transformer or bushing or line capacitors. It is not, however, advocated for actual synchronizing.

ON A widely distributed transmission system involving tie lines between generating plants and interconnections with other operating companies the problem of restoring normal connections after a system separation may be greatly facilitated by the decentralization of load-dispatching authority. On the Alabama Power Company system such decentralization is accomplished by giving the operator at each primary substation or generating plant the authority to energize certain lines or to synchronize across certain line breakers without first communicating with the load dispatcher.

Before assuming right-of-way on any transmission line, it is essential that the station operator have a pilot light or other device on the switchboard to indicate whether or not the line is energized from some other source of power. At semi-automatic or full automatic substations potential indication is also necessary on certain lines for interlocking reclosing relays or for the operation of synchronism check relays.

Ordinarily, potential indication is afforded by a high-tension potential transformer or a capacitor bushing type potential device, which, in addition, also provides the necessary facilities for synchronizing across-the-line breaker in the event the line is energized. Such equipment is expensive and may be justified only when synchronizing is necessary.

Since restoration of normal system connections is usually accomplished by synchronizing at certain key stations or by automatic synchronizing relays at automatic stations, it is evident that at many stations only a simple line potential indication is necessary in order to give the switchboard operator right-of-way on the line. Still other stations can meet their operating requirements with a device which indicates only whether or not a permanent condition of synchronism exists across the open circuit breaker.

The equipment described herein

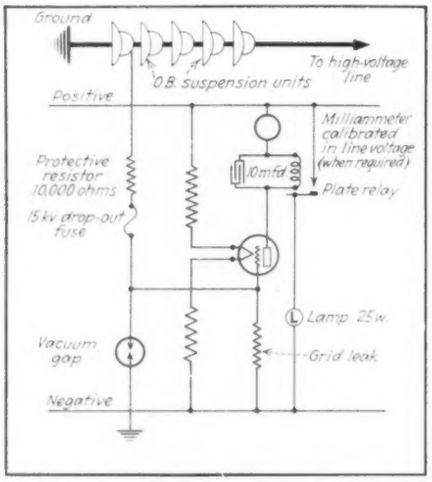


Fig. 1—Tube, protective resistor, fuse and gap the essence of the device

Leakage resistor reduces voltage of grounded unit to tube grid magnitude for maximum plate output. The tube is a standard amplifying tube with high mutual conductance. The filament and plate circuits both receive their supply from a station battery, 130 volts or higher if available. The resistors in series with the filament are so divided as to bias the grid to the point where the plate current is reduced to zero. Under these conditions when alternating voltage is applied to the grid a pulsating direct current flows in the plate circuit.

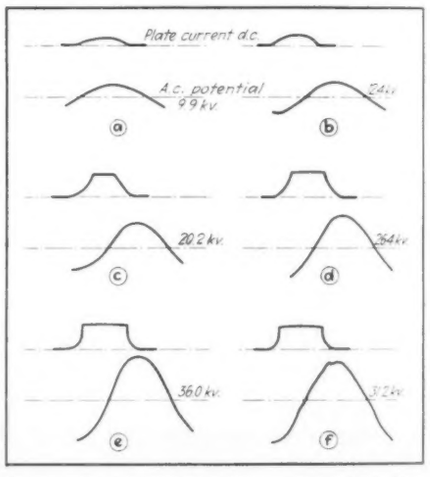


Fig. 2—With rising a.c. potential the plate current approaches a flat-topped wave

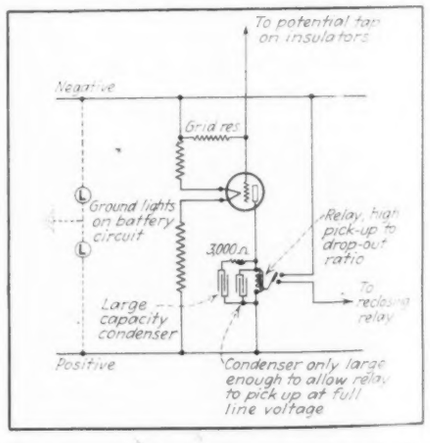

To potential tap on insulators
Negative
Grid res.
Ground lights on battery circuit
3000 Ω
Relay, high pick-up to drop-out ratio
To reclosing relay
Large capacity condenser
Positive
Condenser only large enough to allow relay to pick up at full line voltage

Fig. 3—Modified scheme for interlocking reclosing relay

The circuit closing relay of Fig. 1 is replaced by a circuit-opening relay. The interlocking relay closes contacts after line has been dead for about three seconds.

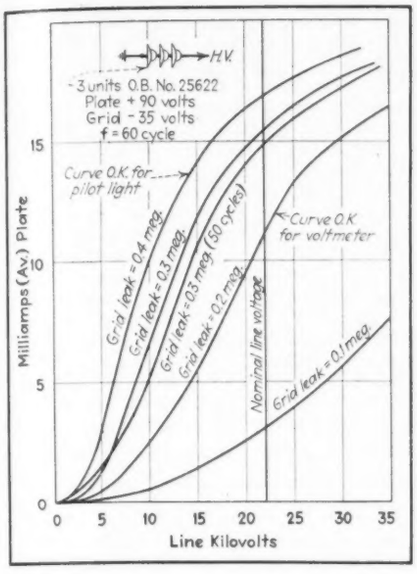

H.V.
3 units O.B. No. 25622
Plate + 90 volts
Grid - 35 volts
f = 60 cycle
Curve O.K. for pilot light
Curve O.K for voltmeter
Grid leak = 0.4 meg.
Grid leak = 0.3 meg.
Grid leak = 0.3 meg. (50 cycles)
Grid leak = 0.2 meg.
Nominal line voltage
Grid leak = 0.1 meg.
Milliamps (Av.) Plate
Line Kilovolts

Fig. 4—Normal voltages fall on straight portion of tube characteristics

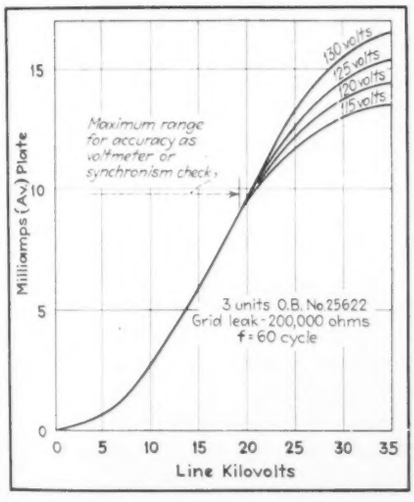


Fig. 5—Varying battery voltage affects results negligibly in working range

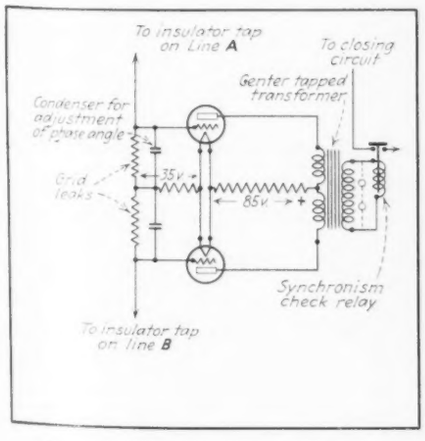


Fig. 6—Scheme as modified for synchronism check

The synchronism check relay gives instantaneous pick-up on out-of-step condition and delayed drop-out after permanent synchronism is established.

was developed to meet the need for an inexpensive, reliable and yet safe potential indicator for use at both attendant and automatic stations where actual synchronizing is not required. It may be used to energize switchboard pilot lamps, interlock reclosing relay or to energize synchronism check relays. It is not recommended for actual synchronizing, because the energy output without further power amplification is insufficient to operate even the most sensitive switchboard synchroscopes now available. The cost of supplying the additional amplification would probably be such as to make a direct capacity device more economical.

The potential device makes use of the potential drop across the capacitative reactance of the grounded unit of a string of suspension insulators. This voltage is fairly high, but due to the high impedance of the insulators only a very small current can be drawn without reducing the voltage to nearly zero. The maximum voltage entering the building is about 50 volts. An elementary diagram of the device is shown in Fig. 1.

A series of oscillograms showing the variation of plate current with variation of the a.c. potential applied to the grid of the tube is shown in Fig. 2. The average plate current increases almost in direct proportion to the a.c. applied potential until the saturation current of the tube is reached. Further increase in the a.c. potential increases the average plate current more slowly, due to the fact that higher instantaneous values of applied potential cannot further increase the plate current beyond the saturation value. The result is the square half wave, as shown in the figure. The range below

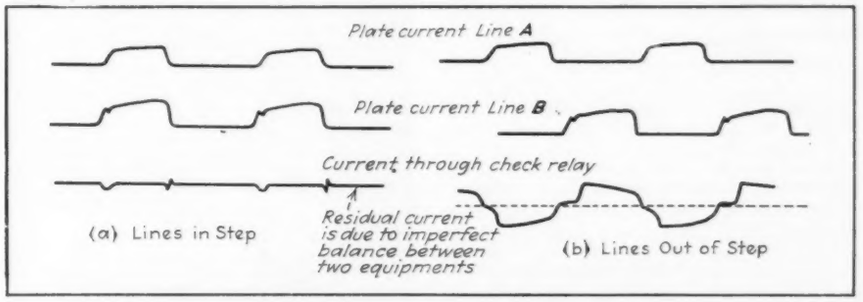


Plate current Line A
Plate current Line B
Current through check relay
(a) Lines in Step
Residual current is due to imperfect balance between two equipments
(b) Lines Out of Step

Fig. 7—Relay actuated under out-of-step conditions

(a) Push-pull transformer has zero flux when lines are in step. (b) When out of step the unbalance magnetizes the core and actuates the relay. The poor wave form is due to the saturation of the tube which is shown in Fig. 2.

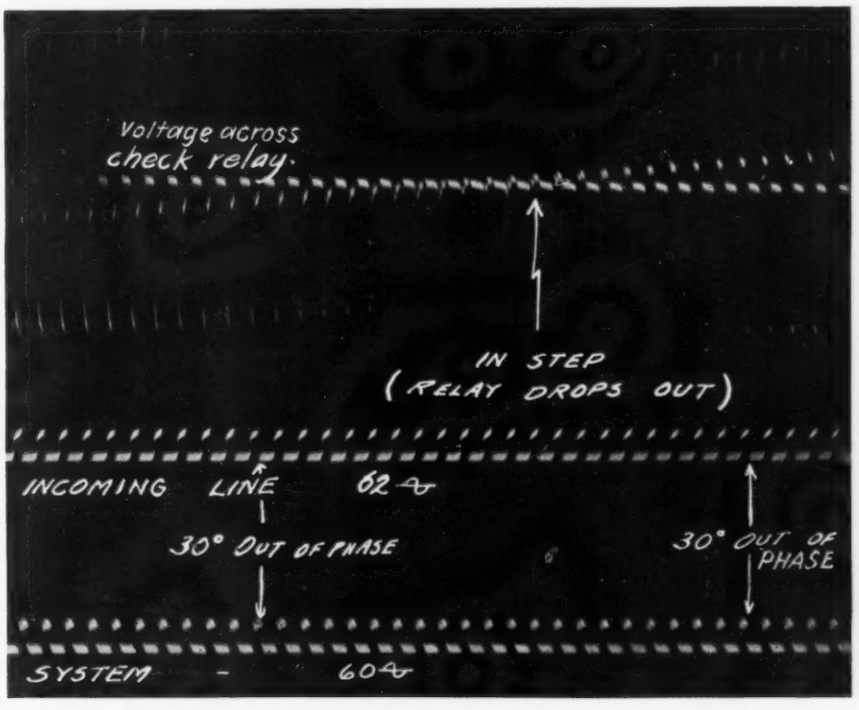


Fig. 8—Oscillogram shows sharp zero at momentary synchronism of out-of-step sources

the appearance of this wave with looped off crest is the satisfactory range for voltmeter applications and for synchronism check. Plate current leads the line voltage by about 90 deg. due to leading current drawn by the insulator string.

Operating relay need not be sensitive

Due to the comparatively large output of tubes now commercially available, the operating relay used in this device need not be a specially sensitive type. A telephone type relay with vacuum contacts is found to be very satisfactory. The condenser across the coil of the relay is necessary to smooth out the ripple and prevent vibration of the relay armature, as well as to reduce the impedance of the circuit sufficiently to pass the required operating current:

This equipment can be used in a number of ways to obtain potential indications:

1. *As a line pilot light,* a lamp is operated by the relay contacts.

For this service the grid leak resistor is adjusted to such a value that the tube will deliver full plate current at about one-third to one-half the full line voltage. This will preclude the possibility of a false indication in event of low line voltage. For this application the relay used should have a low ratio of pick-up to drop-out current, as the relay must not hold in for extraneous static charges sometimes encountered due to induction from other lines or buses in the vicinity of the apparatus.

It is frequently desirable to interlock the closing circuit of an automatic reclosing circuit breaker to prevent reclosing same if the line is energized. To accomplish this, the lamp and circuit closing relay are replaced by a circuit opening relay, the contacts of which are in series with the closing circuit as shown in Fig. 3. Other schemes involving the use of circuit opening or circuit closing contacts can be used for any purpose involving supervision or interlocking with line voltage.

2. *As a voltmeter,* a milliameter is connected in the plate circuit of the tube and the scale calibrated to read line volts.

For this service the grid resistor is adjusted to give full plate current at about 150 per cent of normal line voltage; thus the normal values of voltage to be read fall upon the straight portion of the characteristic curve of the tube as shown in Fig. 4. This results in a very uniform scale except near the zero point, and the accuracy is not affected by variations of battery voltage, except at values of voltage above normal. This latter fact is brought out clearly in the curves of Fig. 5. Changes in frequency also affect the accuracy as shown in Fig. 4 for the 300,000 ohms grid resistor, but changes in system frequency are so slight and so rare as not to justify taking steps to compensate for this condition.

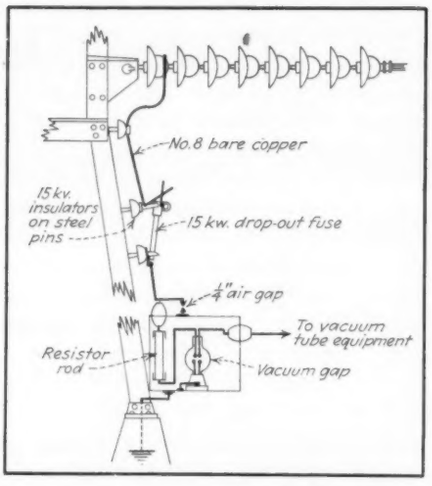
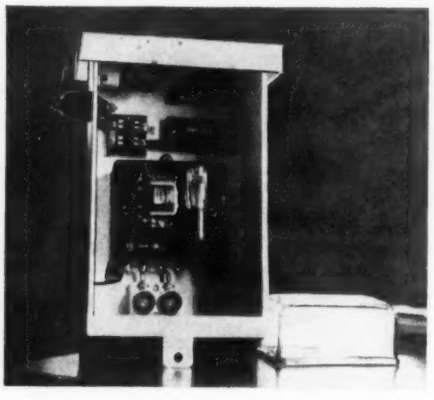


Fig. 9—Fuse, resistor and vacuum gap for protection



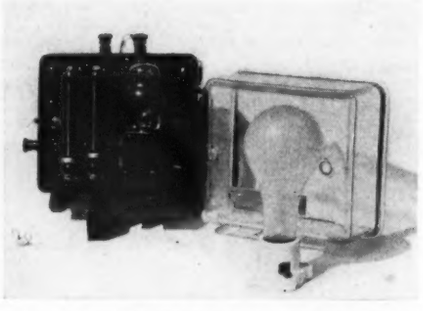


Fig. 10—Thermionic potential indicators in two forms

3. *As a synchronism indicator or synchronism check scheme,* two such equipments are necessary.

The scheme of connections is as shown in Fig. 6. The transformer shown in the plate circuit is a standard radio "push-pull" type. It is evident that for voltages that are in phase the pulses of current in the plate circuits will balance each other and produce no flux in the transformer core, and the secondary will be dead. However, if the voltages are displaced by 180 deg., the pulses of plate current combine to produce a symmetrical a.c. wave in the secondary of the transformer, which may actuate a circuit opening relay to lock out the closing circuit of the circuit breaker. If a small lamp is used in this circuit the systems may be tied together when the lamp is dark. A very small lamp is necessary for this purpose (see Figs. 7 and 8).

Several protective measures required

To prevent the possibility of damage to the equipment, switchboard or personnel certain protective measures are imperative. First, the string of insulators from which the indication is to be taken should have from two to three units more than the maximum insulation used for the remainder of the station. Second, hardware for the string in question should be designed to prevent cascading. Third, the potential tap wire itself should be protected with a vacuum gap protector that breaks down at a fairly low volt-

[*Continued on page 82*]

New Vacuum Device Less in Cost Than Prevailing Potential Indicator

Device	Cost	Advantages	Disadvantages
Potential transformer	Highest	Provides best facilities for indication, interlocking, synchronizing and relaying. Only device accurate for metering. Low maintenance.	High initial cost.
Standard vacuum tube devices connected to "capacity transformers"	2d highest	Provides synchronizing facilities as well as indication. Output of device is accurate reproduction of system potential.	Requires complicated motor-generator set and vacuum tube equipment. Complicated to operate. Costly to maintain. Does not give continuous indication. Power drain from battery is heavy.
Bushing or line capacitors	3d highest	Requires no vacuum tubes. Provides synchronizing facilities and indication. Gives continuous potential indication. Lowest maintenance. Requires no additional floor space for bushing device.	Has low v.a. capacity. Requires special network for correction of phase angle. Requires low energy synchroscope when synchronizing is desired.
Simplified vacuum tube device connected to insulator string	Lowest	Provides continuous indication and interlocking facilities. Provides facilities for synchronism check. No additional floor space required.	Requires vacuum tubes. *Does not* provide synchronizing facilities.

Some Data on Trial Selling

Costs and Return on Six Months' Experience in Selling Ranges and Water Heaters by the Trial-Optional Purchase Plan

By G. C. KING
Sales Manager
El Paso Electric Company,
El Paso, Tex.

RESULTS measured in the net return per appliance per year are an indisputable test of the effectiveness of a load-building campaign. Figures which set forth the results of the six months of appliance selling under the El Paso Electric Company's "Trial-Optional Purchase Plan" indicate that this method is not only an effective means of increasing saturation and electrical consumption but also a profitable means of building revenue.

The mechanics of this plan have already been set forth in these columns (see "The Trial Rental Idea," ELECTRICAL WORLD, October 13, 1934, page 37). During the campaign, which started November 1, 1933, and continued for six months, the 17,242 domestic customers on this system were sold 1,458 ranges and water heaters, an increased saturation of 8.4 per cent. In view of the results, the campaign quota of 250 ranges and 250 water heaters appears to be extremely modest. Since November, 1933, a total of 10.5 per cent of all appliances installed on the trial plan have been returned. Returned water heaters were not depreciated, being sent back as new installations. Ranges were thoroughly cleaned and sent out as "used" at the same monthly payment as the old ones, but for a small reduction in the length of the contract.

These figures give the results obtained in an operation involving the sale of 1,458 electric ranges and water heaters in a market offering 17,242 domestic consumers. Saturation was increased 8.4 per cent. Ranges brought a net return of $12.07 a year and water heaters $6.93. About 10 per cent of these trial appliances were returned and were reissued to other customers. It is an interesting check-up on one of the first experiments in this method of load building that has had time to show actual results

In analyzing the reasons for the returns, high bills headed the list, customers moving out of town was second, followed by the customer moving to another location where equipment is furnished, unsatisfactory service, preference for other types of fuel, and nonpayment—in the order of their importance. These reasons for return were anticipated and the percentage of the returns estimated and provisions

[*Continued on page 71*]

Table I—Expenditures of the Trial-Optional Purchase Campaign

			Combination				
	Ranges	Water Heaters	Ranges	Water Heaters	Total Ranges	Total Water Heaters	Total
Number of appliances	276	271	154	154	430	425	855
Installation cost	$683.83	$3,448.90	$366.60	$1,850.81	$1,050.43	$5,299.71	$6,350.14
Salesmen's commissions	1,563.00	1,409.50	901.25	904.25	2,464.25	2,313.75	4,778.00
Dealer's commissions	270.00	205.00	167.50	167.50	437.50	372.50	810.00
Allowance for old equipment	862.72	704.28	407.02	271.03	1,269.74	975.31	2,245.05
Wiring changeover	1,118.16	892.60	490.27	344.05	1,608.43	1,236.65	2,845.08
Interest on purchases	1,987.20	1,317.06	1,108.80	748.44	3,096.00	2,065.50	5,161.50
Storeroom cost	19,353.96	16,175.86	10,547.38	9,546.65	29,901.34	25,722.51	55,623.85
Advertising expense	1,785.69	1,763.55	996.39	1,002.17	2,782.08	2,765.72	5,547.80
Testing, etc., heaters	.....	566.39	.....	321.86	.....	888.25	888.25
Loss on return of equipment	14.89	266.67	8.42	120.59	23.31	387.26	410.57
Total expense	$27,639.45	$26,749.81	$14,993.63	$15,277.35	$42,633.08	$42,027.16	$84,660.24
Cost of inside wiring	7,936.97	7,015.44	4,016.58	2,767.81	11,953.55	9,783.25	21,736.80
Increase in dist. plant investment	9,883.89	10,726.52	4,112.13	5,565.89	13,996.02	16,292.41	30,288.43
Total capital charges	$17,820.86	$17,741.96	$8,128.71	$8,333.70	$25,949.57	$26,075.66	$52,025.23
Total expense and capital expenditure	$45,460.31	$44,491.77	$23,122.34	$23,611.05	$68,582.65	$68,102.82	$136,685.47
Cost per unit—Expense	100.14	98.71	97.36	99.20	99.14	98.89	99.02
Cost per unit—Capital Expenditure	64.57	65.47	52.78	54.11	60.35	61.36	60.85
Total expenditure per unit	$164.71	$164.18	$150.14	$153.31	$159.49	$160.25	$159.87
Maximum repayment by customer	27,531.00	23,598.00	13,930.84	11,964.26	41,461.84	35,562.26	77,024.10
*Average repayment per unit					96.42	83.68	
Net expenditure per unit					63.07	76.57	

*Due allowance has been made for customers who do not complete their payments.

Brewer Betters Heat Balance

How Turbo-Induction Generator Supplies Process Steam and Drives Compressors — Reliability Assured

By CHARLES STOECKLY
General Electric Company, San Francisco

THEORETICAL efficiencies were turned into practical economies in one of the most interesting plant modernization installations made in recent years, the Rainier Brewery, San Francisco. Because the installation proves that the induction generator is a practical piece of equipment in plants having process-steam requirements and because such plants may well be able to justify the investment in equipment to effect very definite economies, a brief summarization of the conditions underlying the decision to adopt this little-used piece of electrical equipment will be given before entering into a discussion of the installation itself.

Alternatives considered

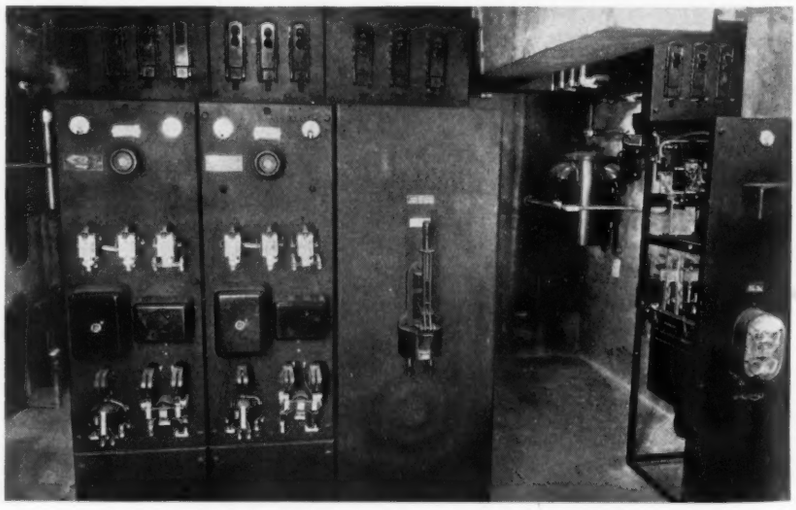
Two vertical ammonia compressors driven by reciprocating engines had to be replaced for mechanical reasons. Several possibilities were considered in their relation to the electric and process-steam requirements of the entire plant. Relatively large amounts of process steam are necessary in brewing operations and the exhausts from the old engines were used to supply the low-pressure steam system. First to be considered was the possibility of driving two new ammonia compressors either with reciprocating engines or with a geared steam-turbine drive. While this retained the advantage of using the energy from the high-pressure steam main before using it in the low-pressure system, it had the disadvantages of an uneconomic heat balance at all times, except when the process-steam requirements were exactly equal to the power required to drive the compressors. Furthermore, the refrigerating system was dependent upon the operation of the steam utilization equipment.

In an effort to eliminate these objections Leland S. Rosener, consulting engineer, under whose direction the installation was made, investigated the possibility of installing a synchronous turbo-generator set, the ammonia compressors to be driven by synchronous motors. In such an installation the generator is tied in parallel with the utility service and supplies such power as may be generated from the process-steam requirements to the plant bus, thereby enabling all the energy in the process steam to be used advantageously. However, in this particular instance, the cost of such an installation could not be justified, even considering the additional reliability provided for the refrigerating system and the additional standby protection in case of utility power failure.

At this point the turbine-driven induction generator was suggested, and the performance of such a set was analyzed. With such an installation the main disadvantage is the necessity of supplying magnetizing current or reactive kva. from the system itself. This is not particularly important with modern designs which can be engineered to cut the reactive kva. requirements to a minimum. Inasmuch as no synchronizing equipment is necessary, and as the frequency of the main power supply for the plant controls the speed of the unit, the cost of the induction turbo-generator set is appreciably less than that of the synchronous turbo-generator set. In this case the first cost was justified by the economy and other advantages which would be obtained.

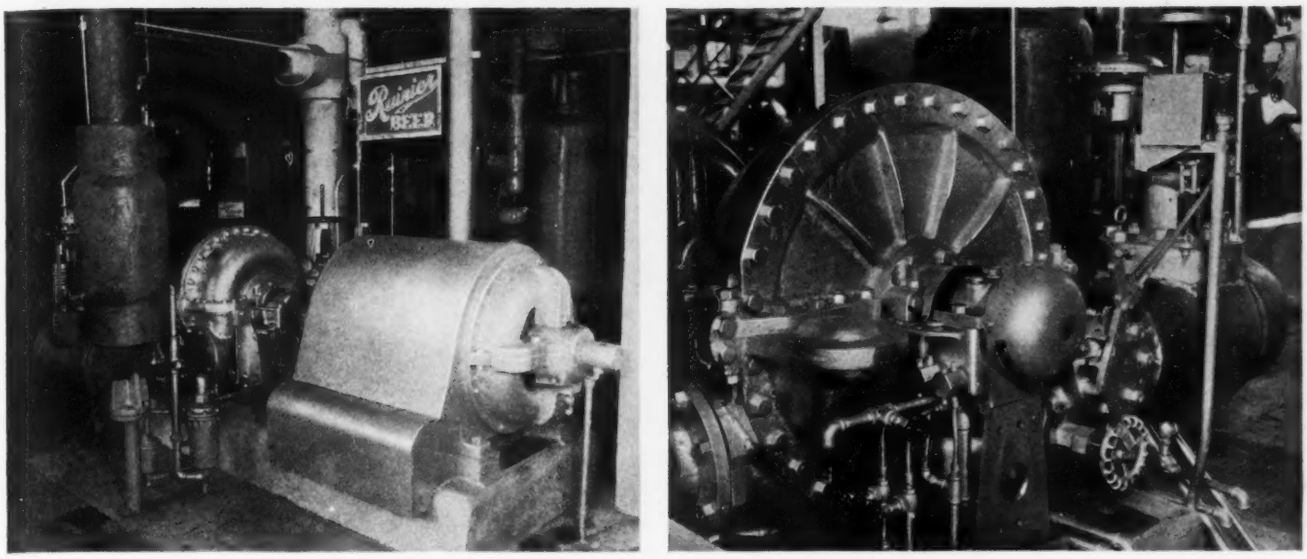
Induction-generator chosen

On the basis of this analysis, the old vertical compressors were replaced with new synchronous motor-driven equipment and a turbine-driven induction generator set rated at 300 kw., 3,600 r.p.m., 4,000 volts, three-phase, 60-cycle was installed. The turbine is connected between the high-pressure steam mains and the low-pressure process-steam system. The entire control for the turbine consists of an automatic throttle valve with an undervoltage trip, a back-pressure governor which operates to maintain steam in the low-pressure system at a constant pressure by opening or closing the valve admitting steam to the turbine, an overspeed emergency governor which trips the throttle valve in case the turbine speed exceeds 3,950 r.p.m. (in case of failure of the main supply the turbine would overspeed if



Simple control for generator and compressors

The panel on the extreme right is the main control for the induction generator, consisting of an oil-immersed 4,000-volt magnetic switch. Control for the two synchronous compressor motors is at the left.



Turbine-driven induction generator in Rainier Brewery

Note relatively simple governing equipment required compared to that of the conventional synchronous turbo-generator unit.

the undervoltage trip failed to operate) and an automatic by-pass valve, which by-passes steam from the high-pressure mains to the low-pressure mains through a reducing valve, should the process-steam requirements exceed the capacity of the turbine. From the above description it will be seen that there is no speed-regulating governor necessary in this installation.

On the generator end there is a speed switch whose contacts close when the set reaches 3,600 r.p.m., connecting the induction generator to the main power supply of the plant. Inasmuch as the induction generator is merely an induction motor driven at or above synchronous speed, it can be thrown on the line in the same manner as an induction motor. The control for the generator is merely a 4,000-volt, oil-immersed magnetic switch, equipped with a thermal overload relay which sounds a warning in the operating room.

Inasmuch as the magnetizing current for the induction generator is supplied from the line, the unit has the effect of lowering the over-all power factor of the plant. This could have been compensated for in one of two ways—either by providing leading-power-factor synchronous motors for the compressors or installing capacitors. In this installation the latter plan was adopted, and the two new 11x13, two-cylinder, single-acting vertical ammonia compressors are driven by individual synchronous motors rated 125 hp., 240 r.p.m., 4,000 volts, unity power factor.

A study of the plant load (including the induction generator) indicated the need for approximately 300 kva. in capacitors, several times that required to supply excitation to the induction generator. Accordingly, a 300-kva., 4,000-volt, pyranol-filled capacitor was installed. This capacitor has amply justified its installation, enabling the brewery to take full advantage of the 5 per cent rate reduction offered by the utility.

The decision to use capacitors was based on three considerations:

First—Mr. Rosener felt that the modernization program under way presented an excellent opportunity to improve the power factor of the whole plant and take advantage of the bonus offered by the power company. This called for more corrective kva. than synchronous motors of normal design could supply, and would therefore have required capacitors in any case.

Second—A study of comparative costs showed that additional corrective capacity could be made available more economically by purchasing capacitors than by paying the higher price for leading-power-factor synchronous motors. This study, for example, showed that the difference between the losses of 80 per cent power-factor and unity-power-factor motors was so high compared with the losses in equivalent capacitors that the saving in energy cost alone amply justified the installation of capacitors.

Third—The capacitors are normally energized continuously, hence their corrective effect is always available. The compressors, on the other hand, are not in operation continuously and the corrective effect of their motors is not always available.

Industrials who are trying to improve their heat balance and utilities which tie in with large process-steam users will find here an answer to their problems. It is the result of an independent consulting engineer's investigation of the most economical solution that will not sacrifice reliability. Simple to operate, requiring no skilled attendance, low in maintenance, the induction generator deserves attention of more plant engineers.

Experience favorable

Operation of the unit so far has indicated that the process-steam requirements of the brewery are sufficient to produce an average output of approximately 200 kw. on the set, just about the amount of power necessary to drive the ammonia compressors. Thus the installation has accomplished exactly the same result as if steam-driven compressors had been installed —that of providing power for the refrigerating system from the energy in the steam—but, in addition, it has provided several other distinct advantages and economies. Inasmuch as all of the energy in the steam passing through the turbine is converted into power, a very efficient heat balance is maintained and the process steam requirements are independent of the power demands of the refrigerating system. In addition, the refrigerating plant is independent of the steam-generating equipment, since the electric motor drive enables the compressors to be run directly off the utility's line if desired.

One of a Series of Intimate Talks with Industry Executives

Leland on Rates for Selling

An Interview by
EARL
WHITEHORNE

•

OUT in Iowa folks live close to the soil. The farmer is the head man. He does his own thinking. He knows his way around politically and has a lot to do with public sentiment in town as well as country.

You might expect therefore that the point of view of an Iowa power company operator might be a bit different from one in an industrial city. So I ran over to Des Moines the other day and had a visit with C. A. Leland. "Cy Leland" is president of the Des Moines Electric Light Company, Iowa Power & Light Company and Des Moines Gas Company, which serve central Iowa. He is an outstanding man among the younger utility executives of the Middle West, a conservative operator, a progressive load builder and an able executive who has made himself part of his community in the eight years that he has lived there, by his natural leadership and enterprise.

Four things to do

I asked Mr. Leland how things look out there close to the late drought and the agricultural end of the New Deal—in fact, in the home town of Secretary Wallace. He said: "I don't think our problem here is any different from that of the rest of the country. But we have set up our policy from a very simple formula. To meet our rising costs and heavier taxes and the growing demand for lower rates we must do four things—get more business from present customers, add new consumers, reduce our production costs and make more friends. We see just one way to accomplish this, and that is to lower rates and then invest money in man-power and in customer equipment that will build domestic load.

"The rate reduction must come first. The beginning of this year we cut our top rate from 6 cents with 5 per cent discount to 5 cents net, a loss of revenue of about 12 per cent. But we advertised and put more pressure behind our merchandising and in nine months had practically caught up. And that's the way it must be done. The lower rate itself only stimulates the customer to more use of the equipment he now has. It adds no new load-building appliances. But it opens the door for more man-power to do a bigger selling job."

The ideal policy, Mr. Leland believes, would be to make small rate reductions frequently, say 5 per cent, each followed by an intensive drive for more load—a regular program—but not announced beforehand. In Iowa they have no utility commission. Each rate reduction must be negotiated with the city council. Predetermined and prepublished rate cuts, therefore, would not work out, because each time there is apt to be a new council to deal with, made up of human beings not averse to credit for the public benefit. Also, each rate reduction is more effective when a complete surprise frankly presented as a method of getting business.

"But as I have said," he continued, "behind the rate we must apply man-power and investment in ranges, water heaters and air conditioning, on a trial-rental and installment basis that will produce immediate growth of revenue. This we are doing here in an experimental way. We have some 45,000 domestic consumers, 35,000 in the city of Des Moines, with an average annual consumption of 655 kw.-hr. per home. Our rates contemplate cooking at 3 cents down to 1½ cents and water heating as low as 0.9 cent.

"We don't like the idea of loaning or renting appliances any more than any other power company. We cannot be extravagant—nor appear extravagant. We feel that our merchandising activities should pay for themselves out of retail profits, plus a reasonable credit for additional load created. This should be, say, 16 per cent of the new estimated annual revenue—to cover renting equipment and load-building commissions to salesmen. But we must all now invest more in the customers' homes than utilities have been accustomed to in the past.

Dealer sales vital

"Like other companies, we are feeling our way carefully into the new adventure. This is a time of change. We make our policies from day to day. If a thing doesn't work we try something else. But the keystone of our program is to build up dealer sales. Our sales department is credited for all load sold by the local merchants and these dealers report to us monthly their sales of refrigerators, ranges and water heaters. We have convinced them of our sincerity and are helping them steadily increase their volume. We count them our greatest potential builders of load. And they know it."

I asked Mr. Leland about municipal plant agitation. He has it here and there at times and he meets it with the same frank policy of action. He has called off the lawyers and when an emergency occurs sends out his employees to carry the facts to their friends and show them where the public interest lies. And it has worked.

But the best defense, he says, is lower rates made safe by selling that fills in a compensating load. And when you come to think of it, that is the history of all business.

CYRUS A. LELAND, president of the Des Moines Electric Light Company, Iowa Power & Light Company and Des Moines Gas Company, outstanding among the utility executives of the Middle West, as a man of judgment and action, a sound executive and a progressive load builder.

ELECTRICAL WORLD

L. W. W. MORROW · EDITOR

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Fair Competition Is Welcomed

IT IS interesting to note that the investment bankers suggest that instead of fighting government competition the private utilities should prove their ability to provide better and cheaper service than the government agencies. This can be done if the government competition is fair. But so long as governmental power agencies receive subsidies, are not taxed and are not called to account on expenditures and receipts the private utilities do not have fair competition. Taxes amount to 3 mills per kilowatt-hour sold, each year's operations are scrutinized for costs and returns and strict regulation is enforced on private utilities, while the governmental competitors are free to do as they please.

The only true yardstick for government power projects should be based upon a fair competitive business condition. This does not exist at present. Yet, despite the subsidies, the private utilities, in many instances, are proving their ability to do a better job than the governmental agencies and they will continue to do so. And eventually the taxpayers and the public will demand that government competition cease or be put upon a fair basis. We venture to predict that when taxpayers find out what the new projects really cost the sentiment for public ownership will subside.

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Reassurance From Washington

BUSINESS and banking have been reassured greatly by recent happenings in Washington. Apparently the Administration has changed its views and some of its personnel in an endeavor to stimulate private enterprise. It recognizes that this is necessary to recovery.

This is particularly true with respect to the NRA. The promotion of Donald Richberg to the post of highest authority next to the President is taken as an encouraging and constructive step by those who are acquainted with him. He has stood for fair dealing and business encouragement, yet clearly recognizes the new conditions and the public interest. He has grown and developed under NRA contacts and holds the confidence of those who know him well. In addition the new recovery board has taken a sane and encouraging attitude toward business. It looks upon business men as partners in working out the future of NRA.

To justify this changed attitude of the Administration business should do two things at once. The first is to get to work with full power on production and marketing so as to bring about more employment. The second is to go to Washington in a constructive and helpful spirit to improve upon existing codes and to suggest the best possible new legislation. Some form of NRA legislation is going to be passed by the next Congress and is now being drafted. Business should co-operate in this work. The electrical industry should play a major part in carrying out these suggestions because it has so much at stake and because it has such a great and golden opportunity to re-establish the merits of private initiative and private enterprise in the public mind.

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Coal and Gas Industries Aroused Over T.V.A. Operations

A VIGOROUS fight against governmental agencies advocating national electrification has been launched by the coal and gas industries. At present this is centered largely upon T.V.A. and E.H.F.A. Resolutions of condemnation and publicity about unfair practices and uneconomic expenditures are prevalent. For example, the American Gas Association passed resolutions condemning the T.V.A., calling it "punitive in nature and not based on sound business principles."

One effect of this fire has been to bring about a proposal from Dr. A. E. Morgan of T.V.A. to form a joint research committee with the coal industry to study the facts about the economic and social conditions in the valley to find where coal and electricity fit into the situation and to study the effects of T.V.A. electrification on coal production and upon employment. A fair-minded committee could develop some very useful information.

But the significance of these developments to the electrical industry lie in the effect of these challenges in restricting and holding within bounds the T.V.A. development, in bringing out economic facts, in having other industries share in the fight to prevent government going into the power business, and, above all, in the frank admission of these industries that the government and governmental agencies are promoting the idea of national electrification. The public is being sold an idea that means increased business for the electrical industry. This sales promotion should be capitalized upon by the industry.

Research Is the Answer to Industry Progress

NOTHING is more certain than change. Change in industry means research of some caliber. Even the producer of the smallest product that looks as if it would remain a staple for years may at any moment meet unexpected competition from a device founded on a better principle. The pressure to create new markets, new profits and sustained business is greater than ever. Any producer who is lulled into complacency by the success of his new commodity is courting disaster. Unrelenting research cannot safely be ignored.

Market tastes and conditions shift suddenly and without warning. There is ultimate saturation to face. There are new duties and requirements in performance. To anticipate the risk of declining volume there is the call for exploration to add new appeals, new elements of quality, new effectiveness to the product. It is a bit dangerous to leave too much to outside laboratories, supported by standardization agencies, the task of determining adequacy and public acceptability of the manufacturer's own products.

No one should know better than the producer how good his product should be to succeed and survive. No one else should have to show him how to make it better and cheaper so that the consumer will get performance, economy, durability and safety for his money. Certainly no one else will tell him what he could be preparing to make when his sales cease to increase. And, in these times, the user of products is busy in meeting new requirements and needs. There must be new products and improvements in old products to get the fullest development of the electrical industry. Research is the answer to industry progress.

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Ideal Specifications for Distribution Transformers

WHAT of the distribution transformer of the future? Admittedly the present transformer situation is not satisfactory; not because of any glaring faults in the transformer itself, but because of the concomitant devices surrounding it like a little army of political hangers-on. These are intended to protect the transformer, but altogether too frequently they develop troubles of their own so that there is the double burden of carrying their cost and of counteracting their troubles.

In an attempt to get away from this double burden some engineers have cut loose from some of these devices. Lightning arresters, for example. But this has not proved the complete answer. Hence a specification really of what a well-dressed transformer should wear, so to speak, will consist of the following: A primary overvoltage protective device, a primary disconnecting device, the transformer, and a secondary disconnecting device. And the disconnecting devices should permit of automatic reclosures unless trouble is very severe or continuous. There does not appear to be any reason why all of these cannot be combined into one factory-built device. But the combination must cost less than the sum of the present individual item costs—considerably less. If this can be done, there is no reason why such a transformer should not supersede the present rather unsatisfactory and too expensive aggregation of devices.

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Remove the Handicaps to the Scientific Portable

RECOGNIZING the need of correlating various portable-lighting interests and affording an opportunity to discuss the problems, Electrical Testing Laboratories performed a valuable service October 24 by assembling 45 to 50 men representing portable-lamp, glass and shade manufacturers, the I.E.S. and the E.E.I. Bureau of Better Light-Better Sight. Their officers deserve the thanks of the entire industry for the constructive way in which they handled various situations.

While the I.E.S. study lamp is receiving wide public acceptance, there is criticism of the severity of lines of the majority of table and floor portables offered. Some manufacturers are offering artistic designs that range up to *de luxe* models, but many other models appear to have been cast in the same mold without regard to æsthetic effects. These can find a wide market where price is a major consideration, but there must be Lincoln as well as Ford models. One lamp designer contends, with authority, that the specified height of the lamp is no handicap to artistic design if the proportions of the base, pedestal and shade are properly handled.

Most important, the I.E.S. portable is a better-sight specialty and must be sold as such and not as merchandise. Utilities which usually sell the utilitarian values must therefore guide its promotion.

Although E.T.L. is taking extreme precautions to check lamps submitted to ascertain that they comply with specifications before issuing certification tags, and is, within the limitations of man-power, rechecking in the field to see if they are consistently complying with specifications, there are reports that some tagged lamps in the field do not comply. Furthermore, some manufacturers who have never received certification are riding on the crest of I.E.S.-lamp popularity and leading the public to believe their lamps have the same characteristics. The most effective recourse is for manufacturers and retailers of I.E.S. lamps to feature the I.E.S. tag in advertising and publicity and point out that it certifies the lamp complies with I.E.S. specifications.

The I.E.S.-portable constitutes too important a link in the national program for bringing about better-seeing conditions to allow anything to handicap its widespread adoption by the public.

Power Plant Bond Issues Voted; Bone Bill Results

Proposals for municipal ownership of public utility systems were submitted to voters in various parts of the country last Tuesday with diverse results.

By an overwhelming vote of 32,623 to 1,858, citizens of Memphis approved a bond issue up to $9,000,000 to purchase or erect a municipal power plant to distribute Tennessee Valley Authority energy. Early returns indicate that the $12,000,000 bond issue for the construction of the Sacramento Municipal Utility District steam plant and distribution system passed by a vote of approximately 19,000 to 8,000.

Referendum No. 18 in the State of Washington on the Bone bill to allow cities to sell electric power outside their borders is conceded to have won, though returns cover only 1,351 precincts out of 2,835. Those casting their ballot in favor of the measure numbered 92,800 and 61,488 voted against it.

Oregon voters defeated a grange measure designed to build publicly owned electric power lines in the state.

At Wapakoneta, Ohio, voters by a 2 to 1 vote favored the construction of an electric generating plant for a municipal light and power system.

At Muskogee, Okla., citizens voted 3,117 to 1,024 against issuance of $1,250,000 in municipal bonds for the construction of a city light and power plant.

Voters in Morenci, Mich., rejected a proposal to borrow $146,000 to construct a municipal electric plant. The vote stood at 435 against and 393 for the proposal.

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Advocates Survey of Meter Practices

That utilities should make a survey of their meter installations and plan a replacement program was the strong opinion advanced by A. L. Carvill of Public Service Electric & Gas Company in addressing recently the power group of the New York section of the American Institute of Electrical Engineers. He said development has been so accelerated that "all meters manufactured prior to 1927 are obsolete so far as their electrical performance is concerned and that none of the rest is adaptable in their present form" to the installation requirements of today. A definite trend toward "application of measured demand rates to small commercial and lighting installations, with the possible extension to certain types of residences," was also discerned. But the prevailing types of block-interval demand meters are still too complicated, too high in maintenance and have the objectionable periodic resetting, which, however, is overcome to some extent by the new demand summation dials.

C. V. Morey of the United Electric Light & Power Company urged that customers' metered circuits be completely separated from the unmetered supply circuits and described a program of executing this founded on the type S meter. In discussing the two papers, A. J. Allen of the same company hinted at a forthcoming revolutionary development in sealing and said further that steel would have to pass from bearings before the twenty-year bearing could become a fact justifying substantially longer intervals between tests.

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Consolidated Gas to Hold Fiftieth Anniversary

On Thursday, November 15, the Consolidated Gas Company of New York will celebrate its fiftieth anniversary. A luncheon meeting will be held followed by exercises commemorating fifty years of public service. President George B. Cortelyou and the board of trustees will be hosts to invited guests and friends on this notable anniversary of one of the oldest and largest utilities.

Knoxville Deal Killed by Courts

Sale of Tennessee Public Service Company's properties to T.V.A. halted by court ruling — Entirely new deal must be negotiated — Authority acquires vital sites in North Carolina

After weeks of utility commission hearings and hard-fought rounds in state and federal courts, the T.V.A. deal to buy the electrical distribution property of the Tennessee Public Service Company in Knoxville and vicinity was knocked out in a state court decision giving thirteen non-resident ice and coal dealers 90 days in which to prepare evidence in their case attacking the scope and constitutionality of the T.V.A. act With the T.V.A. agreement with the T.P.S. bondholders and stockholders expiring October 31, an entirely new deal must be negotiated. Meanwhile a federal court in an entirely separate action rendered a double-barreled decision, one shot of which refused a restraining order on the T.V.A.-T.P.S. deal to a minority stockholder. This seems to remove any barriers in that direction on a future deal.

Public feeling runs high

The delay has aroused the people of Knoxville and environs to quite a frenzy. They thought they saw the promised land of low rates and reputed savings of around $2,500 a day in the community electric bill, only to have the vision prove to be a mirage. Various extreme local statements have been made, mostly without foundation.

East Tennessee appears to be ready to start quite a fight. Before terms for the now-deceased T.V.A.-T.P.S. deal were approved detail plans were drawn and bids opened for the first section of a municipally owned competing system. P.W.A. allotted a loan and a grant for the financing which still stands. Knoxville is again pushing these plans, the second barrel of the federal court decision appearing to make the use of the P.W.A. funds for the purpose legal.

Mr. Lilienthal has meanwhile announced that T.V.A. is not now in negotiation with the T.P.S. for its property. During all the months of recent trading a path has been worn between their offices, so it will not be hard to find a way to resume conversations. As Mr. Lilienthal says: "The failure of the transaction was not due to any difference of price nor fairness to the investor." Terms doubtless could be agreed upon by the two sides.

But indefinite court delays seem in sight to the Knoxville public. They think they can build their own system quickly. Back of this belief appears a deeply-grounded local conviction that the utilities are supporting the effective blocking done by the high-priced legal staff of the non-resident coal and ice dealers. Behind the referee's back local people think there has been plenty of

clipping. Knoxville officials say it is time to fight their own way, even though the T.P.S. suffers. Of course no T.V.A. power will be available to supply Knoxville for some time, but feeling is high and development will be rapid.

T.V.A. purchases reservoir sites

Effectively blocked in some of its important plans by clever legal moves, T.V.A. is using similar tactics to gain the advantage in power-site locations vital to its program. Still unconfirmed officially, T.V.A. is known to have bought two small pieces of property in western North Carolina that put the authority in a position to dictate how either of two great water-storage and power-development projects may be built and operated.

One of these land purchases is in the site of a reservoir planned for some years by the Aluminum Company of America on the Little Tennessee River at Fontana. The other is not far distant at Coleman on the Hiawassee River, where a private company owns practically all of the rest of the flowage rights of a large storage reservoir.

With a dam some 400 ft. high the Aluminum Company has had in mind developing a reservoir with a storage capacity close to the largest in this country. Rainfall on the watershed above ranges up to over 80 in. a year, one of the heaviest in continental United States, so there is ample water. Similar potentialities exist at the Hiawassee site.

Downstream from the vast Fontana storage project are two Aluminum Company water power plants. The latter would be provided a steady flow when needed by the proposed Fontana storage. T.V.A. will eventually have several great run-of-the-river power plants further down on the main river. With an important part of the total flow of two principal tributaries of the Tennessee in private hands, T.V.A.'s lower plants might not get water when they need it most. T.V.A. also is convinced that the entire water power resources of the valley must be developed as an integrated system under federal control.

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Utility Strike Averted

A threatened strike of unionized technical workers of the Public Service Company of Indiana and the Northern Indiana Power Company was successfully averted recently when Gov. Paul V. McNutt promised to appoint a three-man arbitration board. Temporary settlement of the proposed strike, which would have affected 831 Indiana municipalities, was effected after a hurried conference among company officials, labor leaders and government representatives.

Commission Upholds Carolina Project

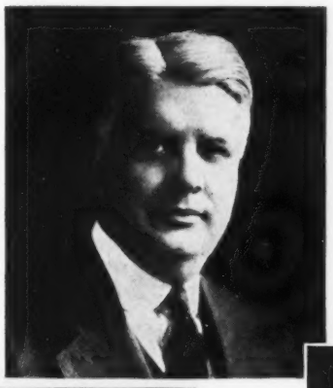
Publicly owned hydro-electric plant on Saluda River approved by Power Commission—Duke protests rejected

The Duke interests lost a prolonged fight last week when the Federal Power Commission approved the Greenwood County, South Carolina, project for construction of a $2,767,000 publicly owned hydro-electric plant to serve three counties in the cotton mill section and 100 miles of transmission and distribution lines for rural electrification.

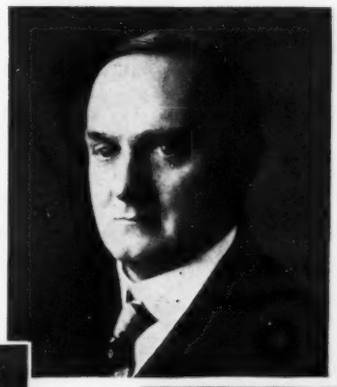
Greenwood County, applicant for the Power Commission license, will build the plant under a Public Works Administration advance of $2,676,000, 30 per cent of which is a grant. An additional $80,000 has been asked for building the transmission lines.

Duke interests had opposed the proposal as an invasion of private rights and a setting up of competition which would reduce the income of the Duke Power Company so that orphanages, hospitals, colleges and other beneficiaries under the Duke Foundation would suffer severely. However, when the case was recently reopened and a hearing set for October 11, the Duke interests said they "saw no need for us to participate."

NEW VICE-PRESIDENTS OF NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION

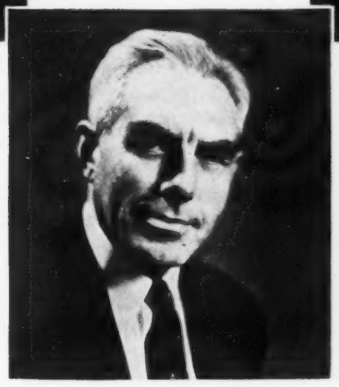


D. G. Phelps
Colt's Patent Fire Arms Company



F. R. Fishback
Electric Controller & Manufacturing Company

Carl L. Peirce, Jr.
Hubbard & Company



E. O. Shreve
General Electric Company

S. L. Nicholson
Westinghouse Electric & Manufacturing Company

Samuel Insull Takes Witness Stand

Assumes full responsibility for acts — Lays ruin to honest errors — Defends associates also on trial — Prosecution stresses organization of Corporation Securities in cross-examination

Taking the stand in his own defense against the government's charge that he and sixteen co-defendants used the mails to defraud investors, Samuel Insull admitted the transactions on which the prosecution had based its case, assumed complete responsibility for them and contended that, far from being unlawful, they were most usual. After reviewing his career from boyhood, he told with pride of his arrival in this country, his association with Thomas A. Edison, his acceptance of the offer of the presidency of the Chicago Edison Company and the subsequent formation of the Commonwealth Edison Company, the Public Service Company of Northern Illinois, the People's Gas Light & Coke Company and the Middle West Utilities Company.

Mr. Insull admitted mistakes. He admitted that he made a mistake when he sponsored customer-ownership with the thought that community ownership of the utilities which he directed might prove a barrier against public ownership. Another mistake, he thought, was in not spreading his financial relations beyond Chicago and New York banks. A third mistake Mr. Insull admitted was in the handling of the purchase from Cyrus Eaton of Cleveland of 160,000 shares of Insull operating utilities at $350 a share. The purpose of this move was to prevent Eaton from wresting control of any of the companies from Insull, and for the purchase itself, Mr. Insull said, he had no apologies to make because the market in the stocks so bought had appreciated. "The mistake I made," he said, "was that I didn't arrange for permanent financing of the purchase by the issue of some securities."

Defends accused associates

Launching into his association with the other defendants, Mr. Insull assured the jury that he, and he alone, was responsible for their acts. After his direct testimony ended, a searching cross-examination was begun by Special Prosecutor Leslie E. Salter, who promptly brought out that Insull's salaries from his companies were $481,000 in 1929, $434,413 in 1930 and $485,767 in 1931.

The Insull family and Halsey, Stuart & Company, four of whose officials are defendants, each received 1,000,000 shares of Corporation Securities common for the securities they contributed to the founding of the company, according to the testimony. Mr. Salter asked the witness if he had not anticipated his holdings being worth $25,000,000 and Halsey, Stuart's the same amount only if the public bought the stock. Insull said it had never occurred to him. Mr. Salter then attempted to show that in the formation of Utility Investments the Insull family turned in securities valued at a much higher price than they had cost. Mr. Insull scoffed at the idea that he had misled the public or concealed anything of the assets of Corporation Securities for the purpose of selling stock.

As a final effort at pinning him down to some admission, the prosecutor took the witness back to the circular offering Corporation Securities for sale in 1929. He wanted to know why this circular did not contain the information that 94 per cent of the stocks carried by the company were in the investment instead of the operating companies of the Insull system. "It never occurred to me," Mr. Insull replied. "Both investment companies held the stocks of the operating companies. It was all the same interest."

Coal Men Fight Federal Projects

National Coal Association at annual meeting adopts resolution condemning government's hydro-power development plan — Forney Johnston attacks T.V.A.

Forney Johnston

At the concluding session of its recent annual meeting held in Washington the National Coal Association adopted resolutions reaffirming the opposition of the bituminous coal industry to the government's hydro-electric power program as exemplified by the T.V.A. and other government agencies now promoting water-power development throughout the country.

"The hydro-electric power development," the resolution read, "now being initiated by the T.V.A. and by other government agencies, and the St. Lawrence project, which is to be revived for action by the next Congress, is without economic or social justification, and on the contrary is both wasteful, extravagant and destructive and ought to be speedily halted. The consummation of this program will increase unemployment instead of relieving it; will dislocate and destroy private industry instead of stimulating it; will effect direct losses of incalculable amount upon the coal industry and related business, upon the railroads, and upon the privately owned public utilities; will impose new large and unnecessary burdens upon the American taxpayers and, taken in its entirety, this stupendous water-power development is calculated to retard rather than promote recovery."

Coal counsel berates T.V.A. invasion

The adoption of this resolution followed upon the association's annual dinner the preceding night, when Forney Johnston, attorney for the Alabama coal operators, scored the government for its Tennessee Valley project. "When federal aid crosses the line of relief," Mr. Johnson said, "and subsidizes one competitive industry to enable it to take the market of another, or itself takes that market, government not only violates its constitutional functions but violates the rules of fair play. . . . When the government crosses the line of governmental functions and becomes a tradesman, it lays aside its sovereignty and violates the law. The industry with which it competes has the right to object, and that is precisely what the National Coal Association is doing, protesting against the subsidized mutilation of its legitimate market by the federal government in its vast and constitutionally indefensible power program." He called the program a political one built around the diversion of federal funds to proprietary and competitive use.

The program of the Tennessee Valley Authority, in Mr. Johnston's opinion, is accompanied by the most amazing lowering of the dignity of the government which this nation has witnessed, with its "band of installment psychologists, kitchen engineers and high-powered advertising to persuade the exhausted citizens of the area that electric gadgets are indispensable to human happiness and social standing."

Gas Industry Asks Curb on T.V.A.

Convention holds that project is unfair competition escaping heavy taxation — Municipal plant loans condemned

Denouncing the Tennessee Valley Authority as unjust and unfair competition, the American Gas Association at its annual meeting held last week in Atlantic City voted to work for restriction of this and any similar public program within fair, normal and economic limits. "The Tennessee Valley Authority program of electric development is founded on use of government funds," the resolution stated, "to which the gas industry itself is a large contributor. The T.V.A. is free from the heavy tax burdens that private utilities must bear and escapes most, if not all, of the costs and limitations imposed by regulatory bodies.

"The T.V.A. does not have to comply with many parts of the government's recovery measures. It enjoys the co-operation of other agencies of government in loans and grants to extend the scope of its electric markets. Finally, it has the backing of federal credit in the promotion and financing of electric appliances and is supported by the powerful prestige of the government of the United States.

"It is punitive in nature," the report continues, "and is based on sound business principles. It violates the avowed purpose of the T.V.A. act itself—to foster 'an orderly and proper physical, economic and social development' of the area. If carried out as announced and if extended to other areas, it will result in grave injury to the gas industry, its workers, investors and consumers."

Addressing the opening session of the convention, H. O. Caster, a member of Henry L. Doherty & Company, New York, charged that the federal government through the T.V.A. and through loans to municipalities to construct their own utility plants was causing an unwarranted destruction of private property.

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P.W.A. Plant Upheld by Missouri Court

Congress acted within its constitutional powers when it appropriated money for loans and grants to municipalities to be used in unemployment relief and for the erection of utility projects, Federal Judge Merrill E. Otis ruled last week in Kansas City in refusing to enjoin the city of California, Mo., against construction of a municipal electric plant. The suit was brought by the Missouri Utilities Company and named the city of California, the city officials, the Fairbanks-Morse Construction Company and Harold L. Ickes, Secretary of the Interior and Federal Emergency Administrator of Public Works, as defendants.

An adverse ruling on a similar case was returned six weeks ago by Federal Judge Albert L. Reeves in a case involving construction of a public utility by the city of Concordia, Mo. (ELECTRICAL WORLD, September 29, page 40).

The Missouri Utilities Company contended the operation of a municipal plant would damage or destroy the private plant and challenged the constitutionality of the loan and grant.

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I.E.S. Lamp Discussed at Joint Meeting

With the purpose of correlating the various interests which have been influential in developing, testing, making and distributing or promotoing the new Illuminating Engineering Society portable lamp, approximately fifty men representing portable lamp manufacturers, lamp and shade manufacturers, the I.E.S. and the Edison Electric Institute Bureau of Better Light-Better Sight assembled October 24 at a dinner conference under the auspices of the Electrical Testing Laboratories.

Several valuable viewpoints and experiences were presented at this conference. Outstanding was the attitude that the I.ES. portable should not be sold as a piece of merchandise but as an electrical specialty for better seeing. Retail outlets for ordinary portable lamps (department stores, dealers, etc.) have always sold on the merchandise basis. Utilities, on the other hand, usually sell on the basis of utilitarian value. Consequently, they are in the best position to promote or aid promotion of the I.E.S. lamp.

San Francisco Opens Hetch Hetchy Gate

A $100,000,000 project which has been under construction for 22 years became a reality on October 28 when the first water was delivered to San Francisco from the Hetch Hetchy Reservoir in the Sierra Nevada Mountains after a 160-mile gravity flow through tunnels and pipes.

Under an agreement between the city and the federal government the municipality will obtain only surplus waters from Yosemite National Park. Through 87 miles of tunnels more than 10 ft. in diameter and 69 miles of steel-pipe flumeway the water will flow into the city from Hetch Hetchy Valley, in the park, an elevation of 3,500 ft., down to but a few feet above sea level. O'Shaughnessy Dam, built at a cost of $6,747,356, turned the Hetch Hetchy Valley into a reservoir lake 7 miles long, holding 67,000,000,000 gallons.

COMING MEETINGS

National Association of Railroad and Utilities Commissioners — Annual meeting, Washington, D. C., November 12-15. James B. Walker, 270 Madison Avenue, New York.

Wisconsin Utilities Association—Annual meeting, Madison, Wis., November 22-23. A. F. Herwig, Executive Secretary, 135 West Wells St., Milwaukee, Wis.

American Physical Society — Annual meeting, Washington University, St. Louis, Mo., November 30-December 1. W. L. Severinghaus, secretary, Columbia University, New York.

American Society of Mechanical Engineers—Annual meeting, New York, N. Y. December 3-8. C. E. Davies, assistant secretary, 29 West 39th St., New York.

American Engineering Council—Annual meeting, Washington, D. C., January 10-12. Frederick M. Feiker, executive secretary, 744 Jackson Place, N.W., Washington, D. C.

American Institute of Electrical Engineers—Winter convention, New York, N. Y., January 22-25. H. H. Henline, National Secretary, 29 West 39th Street, New York, N. Y.

EVENTS IN WASHINGTON

Further consideration of factors entering into the cost of the Lexington Water Power Company's dam on the Saluda River will be given another hearing, to be held at the offices of the Federal Power Commission in Washington, December 4. A hearing on the application of the Pigeon River Lumber Company for rights on the Pigeon River in Cook County, Minn., and in the province of Ontario, where it is proposed to install 40,000 hp., has been set for January 15. A hearing on the application of the Yosemite Power Company for rights on the Tuolumne River in California has been set for February 5.

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In a pamphlet called "Debunking the T.V.A." made public at the Washington convention of the National Coal Association, Appalachian Coals, Inc., refers to the Knoxville purchase as a "shotgun wedding" and cites that transaction as an illustration of T.V.A.'s "power of economic life and death over every privately owned utility caught within T.V.A.'s spider web." The booklet points out that the committee on long-term planning for the Monongahela Valley reports on a series of dams and hydro plants to cost $300,000,000 with an aggregate capacity of more than 1,000,000 kw.

PAUL WOOTON,
Washington Correspondent.

Government Competition Assailed by Willkie at Bankers' Meeting

Entrance of the government into competition with private business as exemplified by the Tennessee Valley Authority is a direct challenge to private industry on a scale hitherto unknown, Wendell L. Willkie, president of the Commonwealth & Southern Corporation, told the recent convention of the Investment Bankers Association meeting at White Sulphur Springs, W. Va. If the government continues to build or finance duplicate electric systems the fate of 90 per cent of the securities of electric utility operating companies cannot be foretold, he declared.

Computation of costs challenged

Denouncing the policy involved in establishing the Tennessee Valley Authority, Mr. Willkie asserted that most electric utility operating companies are selling energy at lower rates than the T.V.A. today, taking into account the same factors. T.V.A. pays as its total taxes 5 per cent of the wholesale price of electric energy, he declared; the electric utility companies operating in the same territory pay taxes equal to ten times this amount. Municipalities, desiring to buy wholesale energy from the T.V.A., receive from the taxpayers' money, he argued, 30 per cent of the cost of building transmission and distribution systems. The Muscle Shoals hydro and steam generating plants, he continued, cost the federal taxpayers $60,000,000 and are to be placed on the books of T.V.A. at $25,000,000, or a subsidized basis of 60 per cent.

The T.V.A., Mr. Willkie asserted, is financed at low interest rates on the credit of all the property and all the earnings of every man, woman and child in the country, for such is the lien on federal borrowing. "Apply these differentials to electric operating companies and you will find their rates much below the T.V.A. rates," he concluded.

Threat to utilities exaggerated

The association's committee on public service securities, headed by Daniel W. Myers, of Hayden, Miller & Company of Cleveland, characterized the T.V.A. development as a challenge to industry in general and the utility industry in particular, since it threatens duplication of facilities and creation of surplus power capacity. The view was taken that "limitation and confinement of the experiment must depend more upon the actual results than upon argument or protest."

"While fear of government competition in its manifold phases," the committee report stated, "has been uppermost in the thoughts of the industry and the investment banker and given rise to nine-tenths of the publicity, we venture the opinion that the actual threat to the integrity of public utility investments from this source is exaggerated and that the welfare of the utilities for many years to come will continue to be determined instead by legislative and judicial control of rates through the commissions and the courts."

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T.V.A. to Join Coal Interests in Fuel-Water Study

An armistice seems to be imminent in the warfare between the coal producers and T.V.A. They may join in a common research of the relative economic merits of coal and water power. Chairman A. E. Morgan wrote the president of the National Coal Association on October 26 suggesting a thorough investigation of the competitive sources. The same proposal was included in remarks by Dr. Morgan at the incorporation meeting of Bituminous Coal Research, Inc., at Washington, D. C., on the preceding day. The letter follows:

The Tennessee Valley Authority proposes to the coal industry that the coal industry and the authority unite in selecting a body of competent, disinterested investigators to make an impartial investigation covering the following points:

1. The cost of electric power generated by the Wilson, Norris and Wheeler Dams with such standby steam plants or such additional water storage as may be economical. In this estimate, the war-time development at Muscle Shoals would be appraised at a fair present value and not at the total investment made under war-time conditions for military purposes.

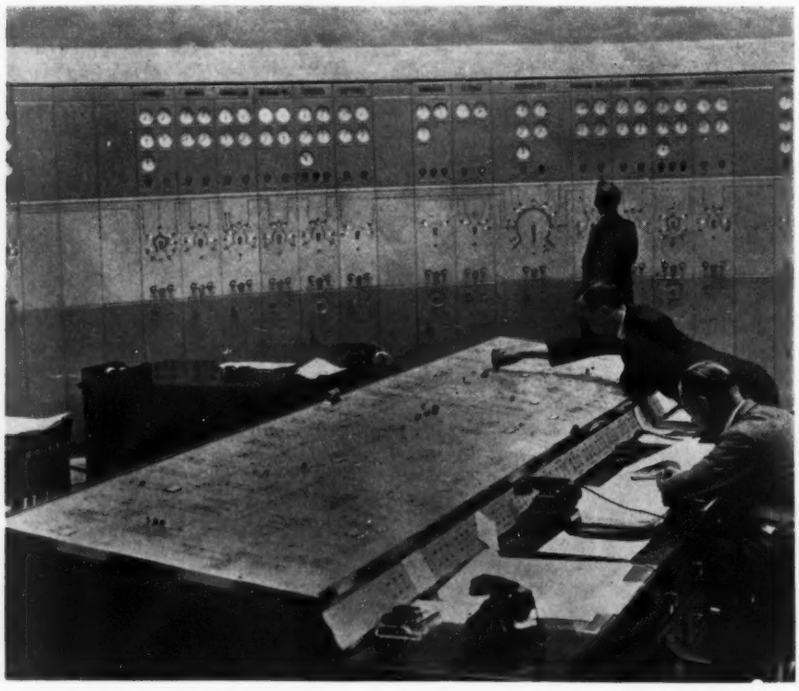
2. The actual cost of coal as mined within reasonable transmission distance of these dams, including indirect government subsidies, if any, to the coal industry, in the form of relief of underpaid or destitute mine workers, and other forms of subsidy. This investigation should include the total actual cost of coal, including its social costs, due to anti-social working and living conditions, if any, within coal mining communities, and what the total cost would be if the coal miners were paid living wages equivalent to the standard paid in the construction of hydro-electric properties and in their operation.

3. The extent to which steam plants are paying less than the market prices for coal by means of buying "distressed" coal.

4. The actual cost at present of generating power in the actual steam plants within transmission distance of the three dams mentioned; also what the cost would be of abandoning the present steam plants, paying off that capitalization, and building new and modern steam plants in accordance with the best modern practice.

5. The cost of meeting additional requirements for power in this region by the construction of additional steam plants of modern design, and the comparison of this cost with the cost of hydro-electric power generated at the three dams mentioned.

THE HEART OF THE BRITISH GRID



The new British Grid system is in operation. Here is the control room for 32 power stations that supply energy to 12,000,000 people in the Southeast grid section. Note the use of flags instead of lights to show system conditions.

Pressure Maintained on Power Sales

Competitive services discussed at E.E.I. committee meetings and at sessions of Great Lakes Power Club

Competition against purchased power in industry is becoming stronger. Two reasons for this trend were brought out in discussions at the meeting of the Edison Electric Institute industrial power and heating sales subcommittee in Chicago held October 18 and at the sessions of the Great Lakes Power Club in the same city the next day. One is the fact of important improvements in competitive services and the other is that the popular and mistaken idea of too high rates has naturally infected industry as well as the public at large. Yet the gloom is relieved by certain hopeful gleams, as was pointed out by several of the brethren at both meetings.

One of these hopeful things is gray iron, best produced in the electric melting furnace for the rapidly enlarging circle of new uses that are found for it. In general, power rates are not too high for this class of business. All that is needed is the intelligent application of rate structure resources to the problem of lowest melting cost to the foundryman. Obviously, a central station that cannot, or will not, serve electric melting on any other than an on-peak demand basis cannot hope for much of this kind of load. The same considerations apply in the matter of electric heat treating. The advantages of electricity in the ways of control, working conditions, quality of product, etc., are becoming less pronounced in the face of the improvements being made in oil and gas furnaces. Again, the answer is intelligent rates intelligently applied.

The program of the Power Club opened with reports of power salesmen representing companies operating in the Great Lakes territory. These reports corroborated in their specific terms the conclusions brought out by the more general discussions of the E.E.I. committee the day before. But from these reports could be taken an additional impression relative to the state of business in, at least, the region represented—first six months of 1933, a perceptibly continuing improvement, then a faltering and a slowing down until now conditions are not much, if at all, better than at this time last year.

J. S. McMillen, Northern States Power Company, read an exhaustive paper describing the federal program of dams on the upper Mississippi and how their construction was making good use of purchased power. A. F. Tegan, Milwaukee Electric Railway & Light Company, and Bert Miller, Wisconsin Power & Light Company, talked about municipal ownership and how to combat it.

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Court Upholds Charges Against A.S.M.E.

Supreme Court Justice Edward J. McGoldrick granted last week an application by John C. Parker, a Philadelphia inventor, for a court inquiry into the affairs of the American Society of Mechanical Engineers on charges that the officers of the society had diverted its funds in running business enterprises not contemplated by the purposes for which the society was formed. The society opposed the application for a court inquiry on affidavits asserting that the petitioner was no longer a member in good standing, because the council or board of directors of the organization had ousted him. The society and its officers denied the charges of improper diversion of funds and contended Mr. Parker's expulsion for making false charges against them was justified.

In making his decision Justice McGoldrick ruled that a trial of Mr. Parker on charges of injuring the society by circulating among the members charges similar to those made in court and his subsequent expulsion were illegal.

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Pacific Gas Slashes Rate for Extra Electricity

A new reduced rate for electric service under which all additional current used by domestic and commercial lighting consumers will be charged for at one-half the regular scheduled price for a period of one year has been announced by P. M. Downing, vice-president and general manager of the Pacific Gas & Electric Company. The rate, which affects 450,000 consumers, will become effective immediately following December meter readings. The rate specifically provides that for qualified consumers a 50 per cent discount will be made on the amount by which the billing for any month exceeds the billing for the corresponding month of the previous year provided the consumer still occupies the same premises.

Simultaneously announcement of a similar reduction of the San Joaquin Light & Power and Midland Counties Public Service Corporation systems was made by A. Emory Wishon, president. This is the third special reduced rate offer made to consumers by the San Joaquin organization during 1934.

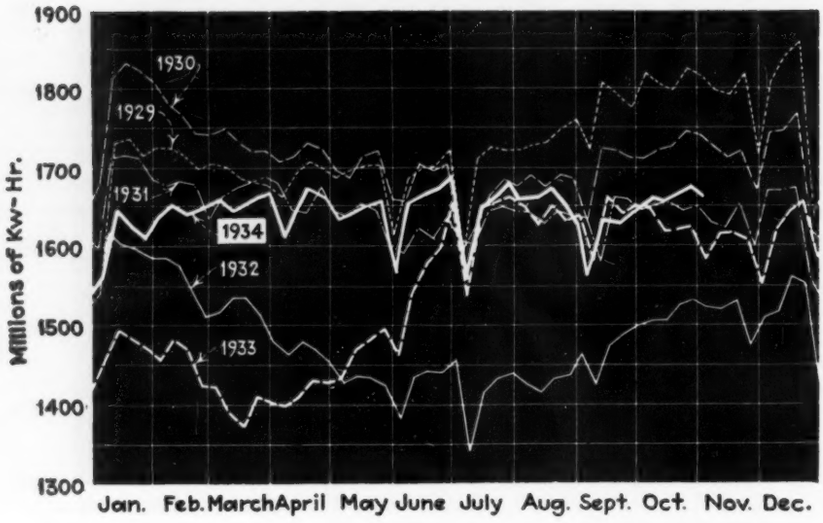
RICHBERG FIRST AID TO ROOSEVELT

Donald R. Richberg has been made executive director of the new National Emergency Council. He thus ranks next to the President in policy formulation and executive power. This promotion speaks well for his good judgment and sane attitude during all the turmoil of the NRA.

This new council will (a) provide for the orderly presentation of business to the President, (b) co-ordinate inter-agency problems of organization and activity of federal agencies, (c) co-ordinate and make more efficient and productive the work of the field agencies of the government, (d) co-operate with any federal agencies of the government, (e) co-operate with any federal agency in performing such activities as the President may direct, (f) serve in an advisory capacity to the President and executive director.

International

Output 5.4 per Cent Over 1933



Contrasting an upward trend since early September with the recession in progress at this season a year ago, the output of electric light and power plants is gradually increasing its lead over 1933. In the week ended October 27 production rose to 1,677,229,000 kw.-hr., according to the Edison Electric Institute, and thereby exceeded every other figure since July. Last week it dropped slightly to 1,669,217,000 kw.-hr., but the margin over 1933 increased from 3.4 to 5.4 per cent. Present operations are about 8 per cent under 1929 and 4 per cent under 1930, but ahead of intervening years.

Every geographical region shows greater output than a year ago, gains ranging from 1.3 per cent in New England—after 21 weeks of deficiencies—to 9.2 per cent in the South and West Central states. The gain of 5.4 per cent in the Central industrial area is the largest for that section since last June.

Weekly Output, Millions of Kw.-Hr.

1934		1933		1932	
Nov. 3	1,669	Nov. 4	1,583	Nov. 5	1,525
Oct. 27	1,677	Oct. 28	1,622	Oct. 29	1,533
Oct. 20	1,668	Oct. 21	1,619	Oct. 22	1,528
Oct 13	1,657	Oct. 14	1,619	Oct. 15	1,508
Oct. 6	1,659	Oct. 7	1,646	Oct. 8	1,506
Sept. 29	1,649	Sept. 30	1,653	Oct. 1	1,499

Per Cent Change from Previous Year

Region	Week ended Nov. 3	Oct. 27	Oct. 20
New England	+ 1.3	— 0.0	— 4.4
Middle Atlantic	+ 5.1	+ 3.6	+ 3.0
Central Industrial	+ 5.4	+ 2.5	+ 1.3
West Central	+ 9.2	+ 7.4	+ 5.6
Southern States	+ 9.2	+ 9.9	+ 9.2
Rocky Mountain	+ 3.6	+ 5.6	+ 7.3
Pacific Coast	+ 3.6	— 0.5	+ 4.6
United States	+ 5.4	+ 3.4	+ 3.0

Westinghouse Cuts Losses; Orders Rise 49 per Cent

Orders received by the Westinghouse Electric & Manufacturing Company in the third quarter of this year amounted to $25,213,271, an increase of approximately 12 per cent over orders of $22,547,717 received in the corresponding period of 1933. Sales billed amounted to $23,963,896, against $17,474,213, a gain of more than 31 per cent.

For the nine months ended on September 30 orders received amounted to $79,105,881, comparing with $52,953,482 in the same period last year, a gain of 49.4 per cent, while sales billed were $69,245,486, against $46,562,269, a gain of almost 49 per cent.

Operations during the nine months ended September 30, 1934, resulted in a loss of $363,787. This compared with a net loss of $7,083,641 for the corresponding nine months of 1933. According to the statement of operations orders booked by the company mounted steadily in volume during the first half of the current year and in spite of a summer decline the business booked in the nine months period was notably larger than for the same period last year.

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Standards Advanced Under NRA Codes

Compiling all nationally recognized commodity specifications has materially aided the Consumers Advisory Board of NRA in reviewing all the proposed codes of fair competition to insure their inclusion of adequate references to quality standards calculated to safeguard consumers' interest. For 663 of the 1,233 codes and supplements there were located specifications formulated or sponsored by 187 separate agencies, including A.S.T.M., the professional societies, manufacturers' associations, etc. In 198 of the 519 codes and groups of codes and supplements that had received official approval on September 30, 1934, there were incorporated references to the requirements in existing standards or to the creation and existence of committees to formulate such standards. Of the 85 references to existing standards and designated agencies to co-operate in the preparation of such standards, 41 were to the National Bureau of Standards.

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Sales Committee Named

Thomas N. McCarter, president of the Edison Electric Institute, has asked the following men to serve on the sales committee this year: H. P. J. Steinmetz, chairman; P. S. Arkwright, J. F. Becker, W. C. Bell, A. A. Brown, R. D. Cutler, J. E. Davidson, D. M. DeBard, L. L. Edgar, R. E. Fisher, W. L. Forst, B. H. Gardner, W. H. Hodge, J. G. Learned, E. W. Lloyd, P. E. McChesney, C. E. Michel, G. E. Miller, J. D. Noyes, P. H. Powers, F. J. Rutledge, W. H. Sammis, H. M. Sawyer, M. E. Skinner, H. F. Smiddy, R. H. Tillman, G. E. Whitwell and H. E. Young.

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Allis-Chalmers Orders Increase 66 per Cent

For the third quarter of 1934 the Allis-Chalmers Manufacturing Company reports a loss of only $84,923, after all charges, including debenture interest and depreciation, on billings of $5,794,954, compared with a loss in the third quarter of 1933 of $381,532 on billings of $4,029,358.

Orders received for the third quarter of 1934 amounted to $5,787,662, an increase of 14 per cent over the $5,072,115 reported for the third quarter the year before.

For the nine months of 1934 the loss, after all charges, amounted to $907,177 on billings of $14,301,206, compared with a loss of $2,040,440 for the corresponding nine months of 1933 on billings of $9,407,976. Orders received for the current nine months amounted to $16,367,530, compared with $9,839,904 for the nine months of 1933, an increase of 66 per cent.

Unfilled orders on the books September 30, 1934, aggregated $8,492,321, compared with $5,873,753 on September 30, 1933, an increase of 45 per cent.

New York Metal Prices

	Oct. 23, 1934 Cents per Pound	Nov. 7, 1934 Cents per Pound
Copper, electrolytic	9.00*	9.00*
Lead, Am. S. & R. Price	3.70	3.65
Antimony	9.625	11.75
Nickel ingot	35.00	35.00
Zinc, spot	4.20	4.10
Tin, Straits	51.20	51.25
Aluminum, 99 per cent	23.30	23.30

*Blue Eagle.

Textile Strike Cuts Output

Confirming the results of the weekly survey by the Edison Electric Institute, which showed that power output during September fell somewhat short of that reported a year ago, the U. S. Geological Survey announces a production during the month by public utility plants of 7,205,000,000 kw.-hr., or 2 per cent less than in the like period of 1933. Average daily production decreased nearly 3 per cent from August, whereas the normal change is an increase of about 2 per cent.

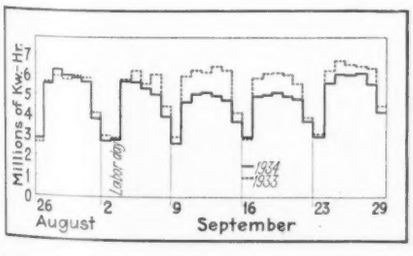
The decrease in production from water power, which began in May, apparently stopped in August, with no further decrease in daily output in September. The September output, however, was 18 per cent less than a year ago.

That the textile strike was in large measure responsible for the decrease in total production is indicated by the sharp reductions, compared with 1933, in those geographical regions in which textiles are a leading industry. The following table shows the changes in per cent:

Region	July	Aug.	Sept.
United States	+1	0	— 2
New England	—6	— 6	— 9
Middle Atlantic	+1	0	+ 1
East No. Central	+5	+ 2	+ 1
West No. Central	+4	+ 6	— 1
South Atlantic	—1	— 7	—14
East So. Central	—6	— 6	—10
West So. Central	+7	+12	+ 2
Mountain	—7	—13	—13
Pacific	+5	+ 4	+ 6

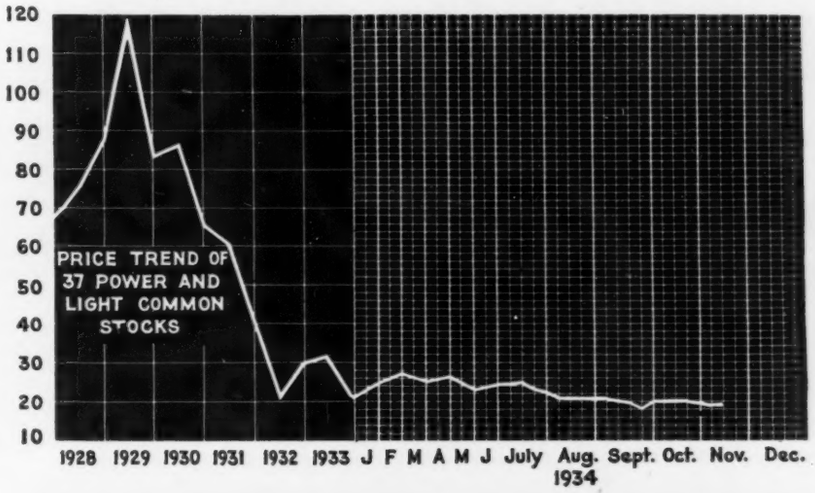
New England power use recovering

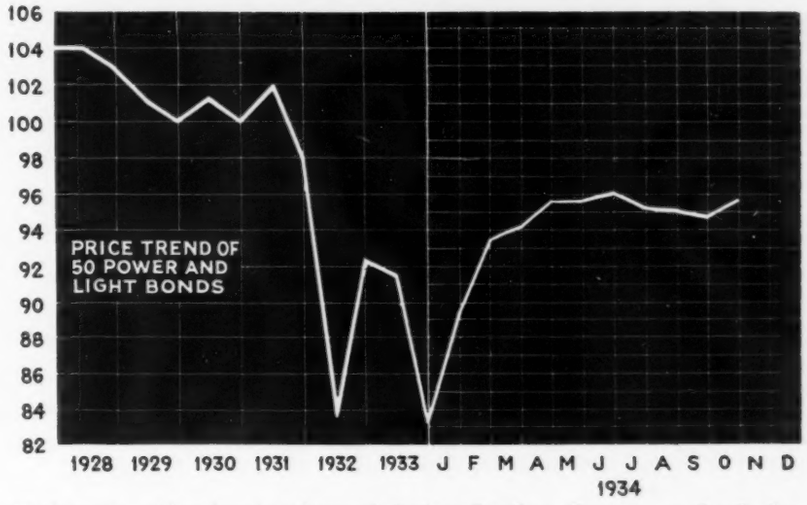
How day-by-day operations were affected by the strike is illustrated by energy consumption on the system of utilities operated by New England Power Association interests. At the end of August primary power production was close to the corresponding 1933 level. The strike began seriously to cut into the system load on September 4, one day after it started; the output for the week ended September 8 was 10 per cent below the same week of 1933 and in the next two weeks the maximum cut of 20 per cent appeared. As business was improving in New England at the end of September, 1933, it is believed that the cut of 8 per cent in the final week was not directly due to the strike, which ended September 24.



Effect of textile strike on New England Power's daily outputs

Utility Bonds Firm; Stocks Inactive





High-grade utility bonds advanced during October close to top levels for the year—*Electrical World* index, 95.7; September, 94.7. Prices of electric light and power stocks are fluctuating in a very narrow range—*Electrical World* index, 19.5; last week, 19.3.

Note Issue Oversubscribed

Heavy oversubscription met the recent offering of $20,000,000 Edison Electric Illuminating Company of Boston 3 per cent notes, dated November 2, 1934, and due November 2, 1937. The issue was priced at 100½ and accrued interest to yield 2.825 per cent to maturity. A heavy demand for the notes from banks was reported, the short maturity fitting in admirably with the short-term investment program many of these institutions have been following.

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Associated Loses Decision

Federal Judge Julian W. Mack has ruled that the petition of a group of security holders for reorganization of the Associated Gas & Electric Company under Section 77B of the bankruptcy act was filed in "good faith," as required by the law. The decision opens the way for protracted litigation in the federal court as to whether the company is solvent. Recognizing that the argument as to the solvency of the $70,000,000 holding company would probably require months of the court's time, Judge Mack virtually invited the utility company to come to some agreement with the petitioners and to file a voluntary petition for reorganization. Counsel for the company, however, indicated that Judge Mack's ruling would be appealed to the Circuit Court of Appeals.

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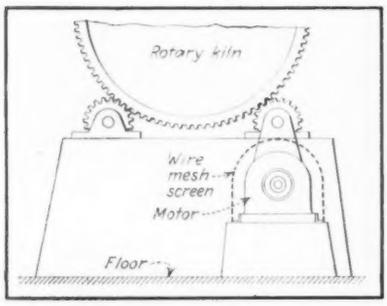
Dakota Utility Tax Void

North Dakota's 12 per cent gross income tax as imposed against certain power companies within the state on October 29 has been declared unconstitutional by a special federal court consisting of District Judge Joseph Molyneaux of Minneapolis, Circuit Judge Archibald K. Gardner of South Dakota and District Judge Andrew Miller of North Dakota.

Motors Protected from Radiated Heat

Motors driving rotary cement kilns usually have to be placed so close to them that they are exposed to very intense radiant heat. In fact, solid or sheet metal 3 to 4 ft. away becomes



Wire-mesh screen protects motor from heat radiated by cement kiln

so heated that it is too hot to touch without experiencing a burn. Despite this situation motors only 28 in. below the kilns in the Alpha Cement Company plant at Easton, Pa., are kept cool to the touch by a simple, inexpensive expedient. It consists of an arch-shaped screen over the motor, open at both ends. The screen, which has a relative fine mesh of coarse wire, obstructs the heat radiated by the kiln and is self-cooling. A sheet metal shield would become excessively hot in the same position, tests showed, and would not be as effective.

By leaving the ends of the screen and motor open cool air which settles over the floor is sucked through and around the motor by the natural ventilating effect of the rotor, keeping the motor cool. The wire-mesh screen maintains its shape relatively well unaided, but angle irons shaped in the form of an arch support the ends and intermediate points.

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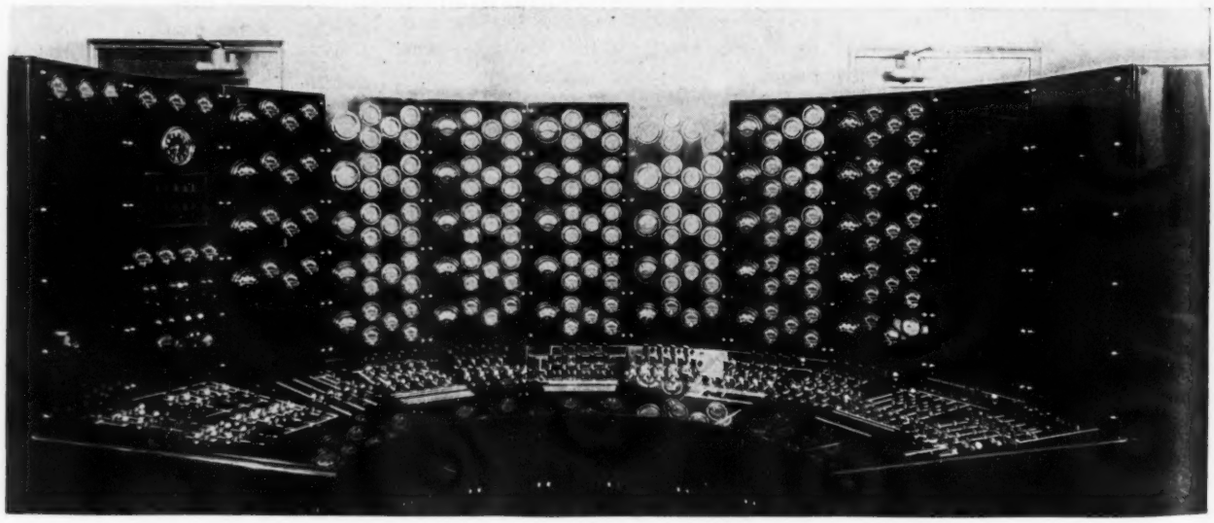
Prevents Spalling of Roof Slabs

When the gypsum slabs, frequently used in the construction of power plant and substation roofs, spall and fall possibly the remedy used by one company will be helpful. This company found that the roof temperatures get so high that dehydration of the gypsum is greatly accelerated, thereby causing disintegration. Spalling has been greatly reduced, if not entirely eliminated, by painting the slabs with an asphalt-base aluminum paint. This seals the gypsum against dehydration, which constitutes the major cause of the trouble.

Savings Made With Miniature Control

By using a miniature control and metering switchboard the Los Angeles Bureau of Power and Light was able to effect appreciable economy not only in the first cost of the switchboard itself, but also in conduit, wiring and other construction items. As the Highland substation, controlled by this board, serves a congested area where real estate values are high, space economy possible with this type of construction was an important factor. With this board control and metering positions for six 33-kv. lines, four 33- to 4.6-kva., three-phase transformers, 32 4.6-kv. regulated feeders and eight street-lighting feeders are provided in a space 11 ft. 6 in. by 5 ft. 9 in. This is said to be less than half the space required for bench-type meter and control boards of the conventional design for a station of the same size.

Current windings of the miniature meters are designed for 0.1-amp., full scale, potential coils for 150 volts, full scale. With these small currents No. 16 gage wire was satisfactory for all meter circuits, thus permitting the use of 15- and 30-conductor, lead-covered control cable in much of the station wiring. Where higher currents



Less than half the size of a conventional switchboard of same capacity

How G-E Power-transformer TANKS Are Made STRONG, WEATHERPROOF, and OIL-TIGHT

Welding a tank in a special automatic welding machine

ALL seams, flanges, and other parts attached to G-E power-transformer tanks are welded. No rivets are used. All openings have flanges welded around them to provide gasket surfaces and allow for tapped holes for bolting. No bolts pass through the cover to the inside of the tank.

To give the highest quality of weld in every case, several types of welding are used. Metallic arc welding is used principally on heavy construction; atomic-hydrogen welding for light work; and oxyacetylene-gas welding in restricted places. For accessibility, all welds are made on the outside of the tank.

Thorough tests are made to prove the tightness of all welds; high pressure is placed behind the weld, and an external inspection is made using a suitable detector.

The care taken in welding G-E power-transformer tanks is typical of every process in the manufacture of these transformers. Each detail, from first design to the testing of finished transformers, contributes to one objective—the most reliable transformer that can be built.

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

310-4

GENERAL ELECTRIC

are necessary for operation of standard equipment, such as protective relays and integrating wattmeters, standard relays are installed at the equipment.

Aside from the saving in conduit and wiring, a 35 per cent saving in the frame and panels of the switchboard itself, a 70 per cent saving by the use of miniature instruments and an 80 per cent saving in control equipment are reported over the cost of conventional, large-sized switchboards of equal capacity. Additional economy also was possible due to the relatively inexpensive meters and equipment used on the miniature board. Future positions could be completely equipped for a low investment and thus save the expense and inconvenience in working over the control board as new lines and feeders are added to the station.

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System Operators Trained in 6 Months

Ever since the adoption of system operators, system dispatchers and load dispatchers by utilities it has been necessary for the industry to select the men from their ranks and educate them to handle the task. Usually the prospective dispatcher has been taken from a generating station or substation switchboard-operating crew and placed in the office with an experienced dispatcher. Aside from regular routine dispatching, months often passed before a severe system disturbance arose calling for quick thinking and acting. Consequently the prospect's opportunities to experience and handle emergency conditions were infrequent and from three to four years had to elapse before a prospect was considered capable of handling a system unaided.

Now a "Dispatchers' Institute," founded by A. P. Broadhead* at Oneonta, N. Y., undertakes to concentrate all of the emergency situations in a course so that trained men can be made available in six months. The equipment consists of offices equipped like regular dispatching headquarters, each containing a different type of system operating board, connected telephonically to a central office in the institute in charge of an experienced system dispatcher. Loads are transferred from one plant or system to another through automatic apparatus giving realistic results. All sorts of system conditions, disturbances and interconnections are simulated by means of special apparatus in the central office.

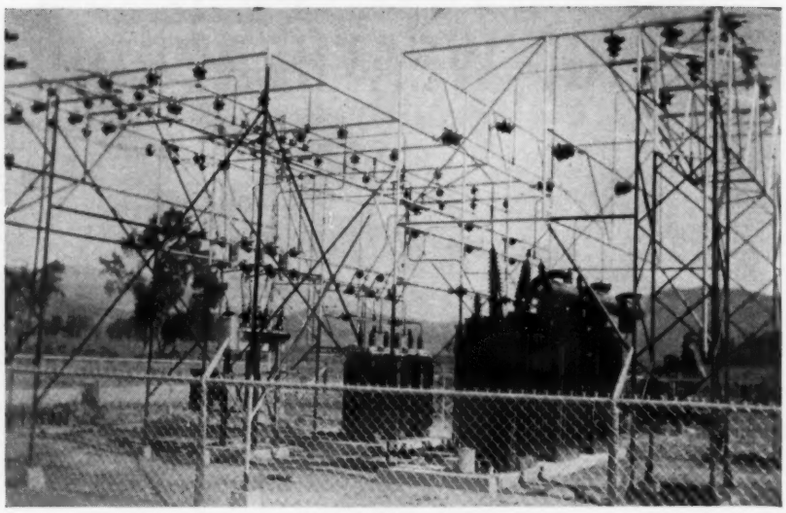
For one hour each afternoon lectures are given on different subjects pertinent to the function, and for an equal period each morning the lecture of the previous day is reviewed in detail to emphasize important points. The remainder of each day—i.e., from 9–12 a.m. and from 2–4 p.m.—the prospects work in the dispatching rooms and there operate the system assigned to them. Every two weeks the students are transferred to a different dispatching office with an entirely different layout and conditions to adapt them to varied situations.

Among requirements of the entrants are: A common school education, a good working knowledge of arithmetic, preferably a practical knowledge of electricity, and experience in power plant or substation operation.

Among subjects covered in lectures are: Weather, load and water-supply forecasting, record keeping and analysis, live-line maintenance, handling wattless exchange, station maintenance and line patrol, and methods of handling system troubles.

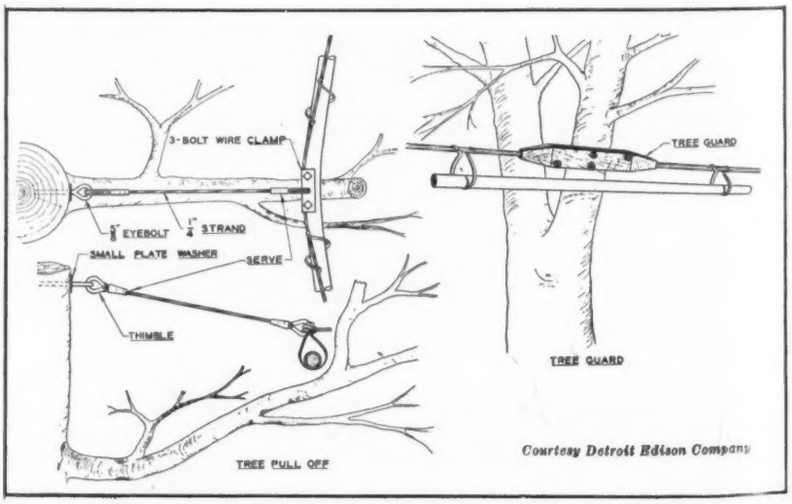
*Formerly superintendent of power, Associated Gas & Electric Systems, Oneonta, N. Y.

Welded-Pipe Bus Structure



The new 60-kv. substation of the Sierra Pacific Power Company at Carson City, Nev., is constructed entirely of 1¼- and 2-in. pipe joined by electric welding. Light, strong and of pleasing appearance, the structure was fabricated and assembled rapidly and economically. Welding and standard pipe sizes made for flexibility in design, as indicated by the towers and truss supporting the incoming 60-kv. line and bus.

Tree Protection for Aerial Cable



Courtesy Detroit Edison Company

Is Your Lightning Protection "PRACTICALLY PERFECT"?

Please Read This!

It can be practically perfect, and the answer is—valve-type arresters applied with interconnection.

A brief report* of the results of lightning protection on the distribution system of the Commonwealth Edison Co., Chicago, states that:

1. **The first year's operation of 5700 distribution transformers with interconnection "shows a 65-percent reduction in transformer troubles due to lightning."**
2. **"The smallest percentage of fuses blown corresponds to those types of arresters which limit the transient voltage to the lowest value."**
3. **The results indicated that with modern transformers, the protection afforded by lightning arresters applied with interconnection "would be practically perfect."**

*"Electrical World," December 16, 1933.

Drastically reduce your lightning losses next summer by installing valve-type arresters applied with interconnection, on every distribution transformer—and, for the highest protective efficiency, specify G-E Pellet Arresters.

330-229

GENERAL ELECTRIC

Department Store Revises Lighting

Stern Brothers store (42d Street, New York) is now completing the modernization of its store-lighting system. The main floor and four upper floors have already been re-equipped. The original lighting installation of the main floor (not illustrated) consisted of 220 glass fixtures of the direct-lighting type. The resultant glare and the strong shadows which were cast brought home very sharply the real need, as well as the merchandising value, of a new, modern system of illumination that would provide "selling light" in place of the uncontrolled and poorly distributed lighting system in use.

Store executives referred their lighting problem to the engineers of the New York Edison Company, who brought about the testing, in the store, of several recommended systems of lighting. Competing units were gradually eliminated and the result of careful analysis and illumination tests led to the recommendation of the Silvray indirect lighting using silvered-bowl lamps. An important factor in favor of this system was the hermetical sealing of the silver reflector to the bowl of the "Mazda" lamp. This eliminated the use of separate reflectors and also obviated the necessity of cleaning and otherwise maintaining auxiliary reflector equipment.

Only 3½ to 4 foot-candles of illumination were provided by the original system. The new installation consists of only half the number of units (110) and is designed to deliver an average of 10 foot-candles of indirect light to the counter level. The size of each bay is 20x20 ft., the ceiling height is 17½ ft. and the lighting units are mounted 38 in. from the ceiling.

Over 2½ times the illumination with half the fixtures of old installation

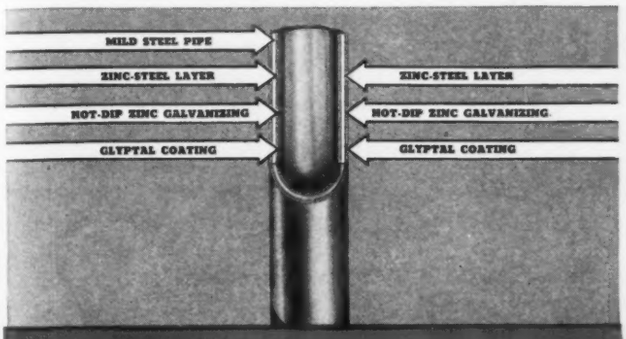
•

Electric Heat Cuts Unloading Costs

Unloading tank cars containing liquids which tend to solidify upon cooling generally requires some form of heating installation at the receiving end. With Mexican asphalt the melting point is about 225 deg. F., so the asphalt, even though loaded in hot liquid form, cools in transit and forms a rough, hard layer at the bottom of the car. As the valve through which it must be pumped out is at the bottom of the car, heat must be applied to start the flow and several methods of heating have been evolved, most of which are expensive both to install and operate.

Electric immersion heaters melt the asphalt surrounding the discharge valve and facilitate unloading

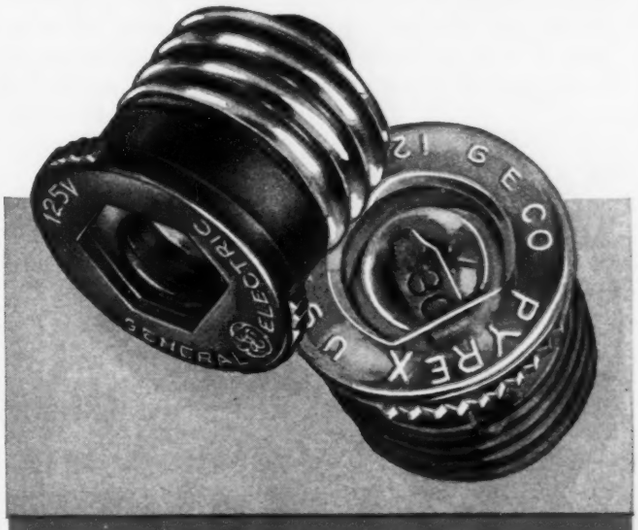
With the assistance of engineers of the Southern California Edison Company, Ltd., a Los Angeles user of Mexican asphalt evolved an electrical installation which permits appreciable savings not only in first cost but also in operating cost, estimated to be as high as $100 per car. Extremely simple, the installation consists of three 4-kw. immersion heaters similar to those used in oil or salt baths. Each heater is mounted on the end of a 10-ft. piece of 1-in. conduit, the other end of which is fitted with a heavy-duty plug. Flexible, rubber-covered conductors connect the units with outlets on the side of the building. Upon arrival at the siding, the manhole cover of the car is removed and the electric heating unit inserted. Steam connections are also made so as



G-E WHITE CONDUIT

A Constant Protection

G-E White is explosion-proof — vapors, dust, gases, will not enter the wiring system. Clean threading, easy bending, fast wire-pulling place G-E White among the most economical of wiring installations. Finest mild steel is its base. Hot-dipped galvanizing plus a heavy Glyptal coating make its protection permanent.



TWO FUSES

*"Pyrex" or Composition

*"Pyrex" or Textolite Tops — both protect — both are accurately rated. Fuse strips are close to windows — show clearly when blown. Pyrex top magnifies fuse strip. Textolite Fuse has a clear mica window. General Electric offers a fuse plug for every use.

*"Pyrex" (Reg. U.S. Pat. Office) is the high heat and electricity resisting glass. Textolite is General Electric's special insulating composition.

For samples and complete information see your nearest G-E Merchandise Distributor, or write to Section CD-218, Merchandise Dept., General Electric Co., Bridgeport, Conn.

GENERAL ELECTRIC

MERCHANDISE DEPARTMENT, GENERAL ELECTRIC COMPANY, BRIDGEPORT, CONNECTICUT

to melt any asphalt that might cling to the steam coils with which such cars are equipped. Within two hours the asphalt around the valve is completely melted, the function of the heaters being to keep the valve open and not to melt the entire mass within the car.

•

Welding Widely Used in Industry

Industrialists have been slow to recognize the extent to which the electric arc can be used profitably for the deposition of metal for production and repair purposes. Expansion of usage has occurred chiefly since 1914, not only in the field of plain steel but also for alloy steels and non-ferrous alloys, according to A. M. Candy, welding engineer Westinghouse Electric & Manufacturing Company.

Around steel mills welding has been used to build up broken teeth in drives, worn pads or pinion shafts and spindles, also collars on rolls. A case is reported where the cost of repairing both ends of two pinions amounted to $170, whereas new pinions would cost $1,000 apiece. Much equipment is fabricated with economy by welding. For example, a soaking pit crane, so fabricated, required 1,200 ft. of welding wire and the wire and labor cost $550. Transfer tables and rolls are also completely constructed by welding.

A number of pipe manufacturers are equipped to turn out pipe welded by different processes—electric arc, roller resistance and inductive flash welding. Numerous all-welded pipe lines and aqueducts have been constructed in the western and southern parts of the United States in recent years. A great deal of interesting welding is being used in the Boulder Dam project. Penstocks ranging from 8½ to 30 ft. diameter, also cylindrical gate valves, are so constructed.

Within recent years welding has been used for producing a large variety of both heavy special machinery and smaller machine tools, jigs and fixtures. For example, a large press (29 ft. x 12¼ ft. x 28 ft.) rated at 1,800 tons and used to press two automobile side frames simultaneously, was fabricated by welding. The welds carrying heavy stress were made with heavily coated electrodes, while those carrying nominal stress were made with bare electrodes. Generators, motors and bedplates have been made with simple structural steel by welding.

All manufacturers who require jigs and fixtures will find surprising economies with welded construction, as such equipment can be largely constructed from scrap material. The fixture can usually be completed in less than one-quarter of the time required for a casting.

Welding has been applied for several years to the construction of locomotive frames, tenders and cabs.

•

Solves a Problem in Cadmium Plating

Various materials have been tried in the cadmium-plating division of the Westinghouse Electric & Manufacturing Company for the barrel used in this severe electrochemical operation to hold the small pieces being plated. But objectionable characteristics were experienced with all but one of the materials tried, according to J. Corbit, in charge of that division. The life of wood was very short. That of asbestos was two months. Rubber was not found usable because of its warpage in warm solutions.

The electroplating barrel which gave the best performance was made with 1¼-in. "Micarta" duck-board ends and ¼-in. panels of the same material. It has been in service more than five years.

In the same department a barrel composed of the same material has been in service eight years in a copper-cyanide solution. Even longer service may be obtained in a nickel solution, Mr. Corbit declares.

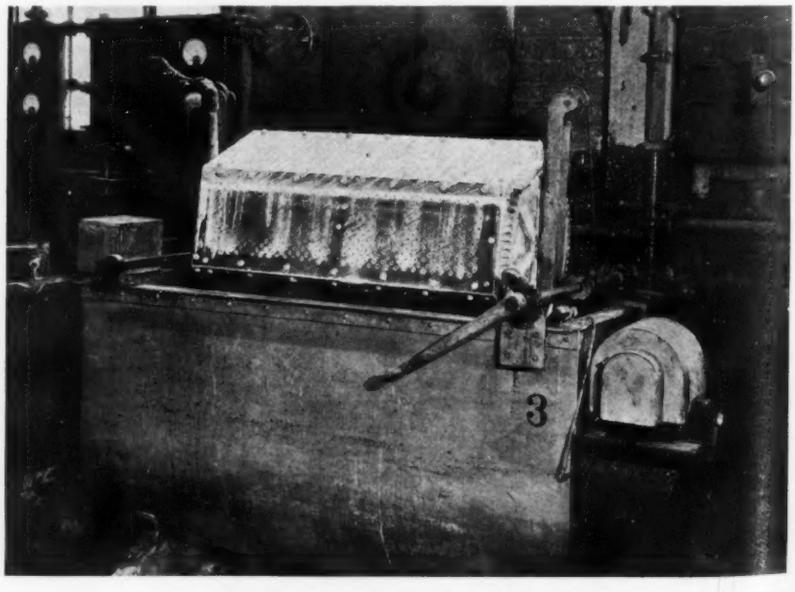
•

Pretzel Oven Has 97% Load Factor

Interest in electric ovens for baking pretzels has brought forth some additional information from G. P. Parry, power engineer Metropolitan Edison Company. He reports:

"The first electric oven used in this industry was installed locally in 1928. This oven has a baking chamber 50x4 ft. and a connected load of 152 kw. It has operated on an average of eighteen hours per day and six days per week since installed, and its production ranges from 250 to 300 lb. per hour.

"Since the initial installation three other pretzel bakeries have installed four electric ovens. Two of these are travelers, one of which has a connected load of 225 kw. for baking 'pretsticks,' and two are 16-ft. rotary ovens with connected loads of 45 kw. each. These ovens have excellent load factors since the usual pretzel plant operation is three eight-hour shifts per day. We experienced one two-month period when our largest plant with 377 kw. in two ovens had a load factor of 97 per cent. Operation at this plant was 24 hours per day and seven days per week. The Universal Oven Company, New York City, manufactures approximately 75 per cent of the ovens used in the pretzel industry."



Cadmium-plating barrel has long life

2500 members we are prepared to answer the questions our advertising will stimulate.

We invite companies and individuals engaged in the production and sale of power and power transmission equipment to join us in solving power-cost problems in the best way for the customer. An invitation is also extended to join or form a Power Transmission Club.

We shall be glad to send you, — (1) *A Roster of the Membership and Locations of Power Transmission Clubs;* (2) *Suggestions for forming a Club;* (3) *Case Studies and other educational literature in sufficient quantities for distribution among interested personnel.*

The Power Transmission Council is acting on the conviction that it is the joint responsibility of us all—producers and distributors of power, power units and mechanical equipment for the transmission of power—to develop and recommend *the best way to get the power to the work.*

* * *

Power Transmission Clubs have been organized in key industrial cities to render constructive service to customers. Their number is growing. Members are qualified to render constructive service as a result of study of supplied case information as well as local plant problems.

POWER TRANSMISSION COUNCIL

(Sponsored by Mechanical Power Engineering Associates)

An association of producers and distributors of power, power units and mechanical equipment for the transmission of power.

370 LEXINGTON AVENUE, NEW YORK

THE BEST WAY TO GET THE POWER TO THE WORK: THIS IS THE JOINT RESPONSIBILITY OF THE INDUSTRIES ENGAGED IN THE PRODUCTION AND APPLICATION OF POWER TO MANUFACTURING.

Air and Water for Motor Cooling

Cooling of motors is taking a new turn. Air cooling of inclosed motors by outside and inside circulation is now common. Water cooling is not so common, but there have been several installations. Some of these are in places where ambient temperatures are inescapably high, others where frequent short cycles of reversals and high torque peaks would make an ordinary motor inordinately large. A few cases have happened where water cooling made possible a motor in the same space, even though the burden on it had been increased to a considerable degree.

That the trend is toward external cooling systems for motors is also indicated by the provision in three or four new buildings of air pipes and ducts in the columns or walls, for no other purpose than to supply piped cooling air to motors. Cost of doing this might easily be less than the otherwise added cost of fan motors designed for self-cooling. Against this shift in practice can be set the virtues of water cooling. One motor manufacturer has found that water with its high specific heat and specific gravity, along with intimacy of contact with the surfaces to be cooled, requires only 1/3,500 as much volume of cooling water as air.

It is natural during the initial stages of such a transition in practice to experiment with several alternative approaches. A steel man says he is using spray to cool some of his heavy-duty motors. A motor manufacturer meets this explorative disposition of the user by providing motors with a water jacket having top and bottom covers. With both off the motor is an ordinary inclosed 20-hp. fan and air-cooled motor. With the top one off and a drain opened in the bottom cover it becomes a 35-hp. splash-cooled motor. With both covers in place it becomes a 50-hp. water-cooled motor.

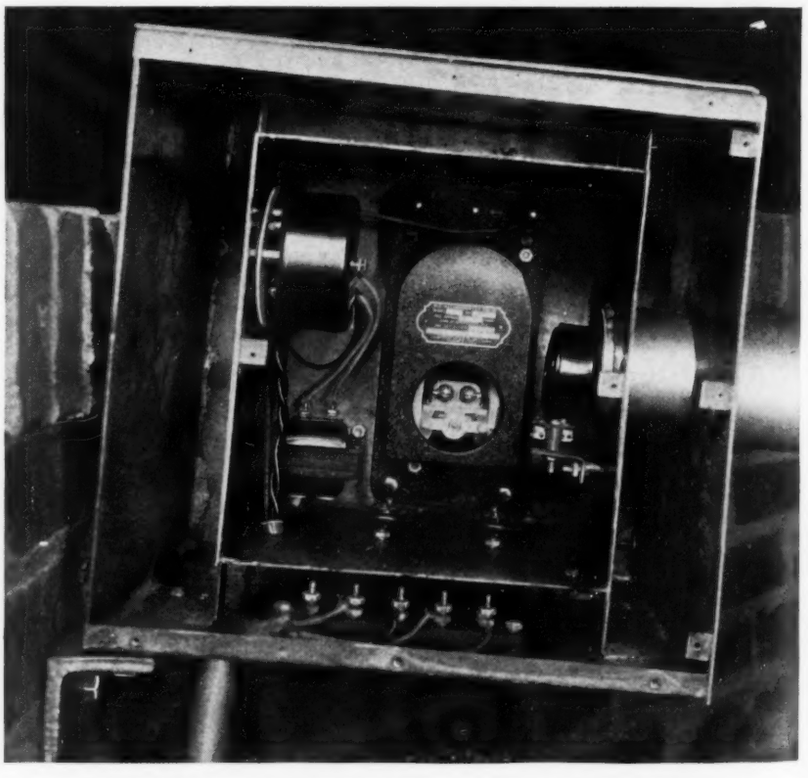
Of course some will deplore putting the N.E.M.A. standard motor a bit in the shade by these moves toward fresh specialization. But the N.E.M.A. motor is a general-purpose motor with an eye to routinized application that abounds where mass production thrives. Supplementary cooling is a new factor of economic balance in motoring costs wherever industry is driven by highly competitive economy to resort to new processes of production which impose exacting demands on the drives. Motor buyers will do well to see whether motors they buy now can have water cooling or system air cooling added effectively later when they choose to throw added burden on the motors in use.

Heats Windows Electrically

Tubular electric-heating elements, mounted horizontally and in series at intervals on the inside of office and commercial building windows, are being used in Germany to minimize the chilling effect of large window exposures, as shown in the illustration on page 62.

Very large windows, such as those in churches and factories, are more difficult to handle because the heating tubes start a circulation of air without being able to heat the window

Photronic-Cell Lightning Protector

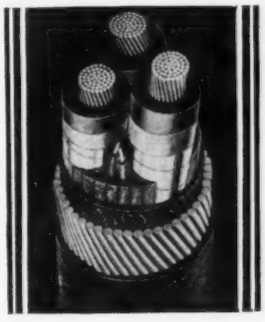


Located at the base of WLW's 500-kw., 831-ft. vertical radiator antenna there is a photo-electric arc extinguisher to protect the equipment from lightning. It prevents loss of power and interruption of broadcast by chopping off power-follow arcs subsequent to a lightning discharge across the safety gap. The photronic-cell and its associated relays, doubly shielded against radio frequency, act on the radio-transmitter control circuits to cut off the plate voltage for a fraction of a second, during which the arc would drain the antenna of energy. The equipment was furnished by the Weston Electrical Instrument Corporation.

IN SUBMARINE CABLES

IT'S WHAT HAPPENS UNDERNEATH THAT COUNTS

AFTER all has been said and done—and after all the laboratory tests and formulae have been made and studied—there is only one unfailing method of determining which submarine cable will serve better and last longer. In the final analysis—**it's what happens underneath that counts. American Steel & Wire Company Leadless Submarine Cables** offer many technical advantages—and, in addition, have definitely demonstrated their superiority under many and varied conditions of usage. There are many vital performance and economy reasons why you should specify them—reasons that we will gladly forward to you on request.



1831

1934

AMERICAN STEEL & WIRE COMPANY

208 South La Salle Street, Chicago
94 Grove Street, Worcester

SUBSIDIARY OF UNITED STATES STEEL CORPORATION
AND ALL PRINCIPAL CITIES

Empire State Building, New York
First National Bank Building, Baltimore

Pacific Coast Distributors: Columbia Steel Company, Russ Bldg., San Francisco

Export Distributors: United States Steel Products Company, New York

itself, and the moisture condenses excessively on the panes. This difficulty is easily removed by the adoption of what might be called a heated screen, composed of fine heating cable arranged in venetian blind effect to cover the entire window surface. Or if this is objectionable the heating cable can be inserted at the separation between panes of glass and thus be

Heating cable across windows reduces radiation and consequently heating requirements

rendered relatively inconspicuous, as shown above.

According to M. Kind of Berlin, writing in *Der Werbeleiter*, it is necessary to figure on 6 watts of heating cable per square meter of window surface per degree C. difference of temperature between the room and outdoors. In Germany the least difference of temperature is around 25 deg. C. in winter, so that 150 watts is necessary for each square meter of the window surface to attain maximum effectiveness of the installation.

Remodeling Sub for Metal Clad

By RICHARD BANZ
Chicago, Ill.

Whether the installation be indoor or outdoor, of open type or metal-clad construction, every important substation has to have a supply of energy for its own light and power uses. If the installation is an outdoor metal-clad job then the familiar pipe rack and open bus over the house service transformers look rather incongruous. In order to make these station supply installations conform in appearance and in mechanical ruggedness with the main substation equipment, the Public Service Company of Northern Illinois makes them metal clad in very simple fashion.

It was an easy matter to fit sheet metal boxes with openings for 3-in. conduit to the secondary sides of the transformers since the secondary leads are close together. But making a conduit connection on the primary side of a distribution type transformer is another matter. The primary leads are separated by practically the whole width of the transformer case and a single terminal box to cover both of them would be difficult to make, to say the least. Obviously, the thing to do was to bring the two leads out at the same point in such fashion that a conduit connection could readily be made.

The accompanying drawings show the general layout of the whole installation as well as a detail of the primary connection. It is to be noted that the 2½-in. primary conduit line includes pull boxes at each of the transformers. From each of the pull boxes rises a short piece of conduit screwed to a nipple protruding from one of the primary lead openings in the transformer case. The other opening is closed off. Screwed on the nipple inside the transformer case is an Appleton type BE Unilet body. The standard cover of the Unilet is replaced by a specially designed sheet metal cover with two openings with porcelain bushings for the leads and a third opening on top through which the body is filled with insulating compound after the leads are pulled in.

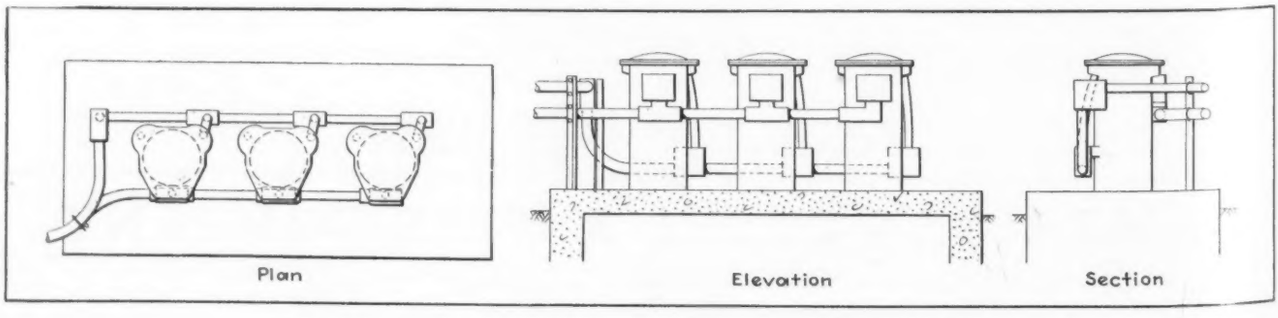
•

Volts Indicated by Sphere-Gap Forces

Mechanical pull between the excited spheres of a measuring sphere gap is considerable and may, according to an item in the *Electrotechnische Zeitschrift* of August 23, 1934, be used practicably for measurement purposes.

Between two 25-cm. spheres a pull of about 100 metric grams exists when excited with 300 kv. Balls of 75 cm. diameter exert a pull of 800 grams when connected to 1,000 kv. These forces are a great many times more than the average torque available in customary electrical measuring instruments. By supporting the upper sphere on the end of a spiral spring its motion can be easily transmitted over a thin wire to a multiplying lever, at the end of which is fastened a small mirror. A ray of light from a simple optical system is reflected from this mirror and plays along a scale on the wall of a room. Since the motion of the movable sphere is only a very minute amount for the full scale deflection, the inaccuracy of changed spacing can be neglected.

Obviously the device measures effective, not crest, values. Voltmeters of this type have been built and have proved very satisfactory. The construction can be easily added to existing sphere gaps.



Conduit connections easily made to distribution type transformers

INSULATING MATERIALS

DILECTO Laminated phenolic material in sheets, rods, tubes and fabricated parts. Used in radio, telephone equipment, instrument panels, electrical appliances, machinery, machine tools, oil burners and many other devices.

MICABOND Mica in its most usable form. Sheets, tubes; machined, punched and molded parts. Widely used for commutator segments, rings, cones, cores; and all types of heating, lighting and power equipment.

DIAMOND VULCANIZED FIBRE Hard vulcanized, tough, practically indestructible. Economical. Sheets, rods, tubes; machined, bent or formed parts. Widely used, in almost all electrical devices, and also numerous mechanical applications.

VULCOID Vulcoid combines in an economical insulation the desirable properties of all laminated fibrous insulating materials. It is a hard, dense material, tough, pliable and strong. It has high electrical insulating properties and exceptional resistance to moisture and water.

CONTINENTAL-DIAMOND supplies materials to meet practically every insulation requirement, whether electrical, mechanical or thermal—tried and proved products, known and used throughout the electrical industry.

In addition to accepted insulating materials, we offer you engineering service to help effect manufacturing economies and improve product quality — consultant service from numerous district offices—complete manufacturing facilities and fabricating service—from plants at Newark, Delaware, Valparaiso, Indiana and Bridgeport, Penna.

Your inquiries are invited.

CONTINENTAL-DIAMOND FIBRE COMPANY

NEWARK, DELAWARE

CHICAGO CLEVELAND NEW YORK LOS ANGELES SAN FRANCISCO SPARTANBURG, S. C. BRIDGEPORT, PA.

Also manufacturers of Fibre Boxes, Cans, Trucks, Baskets and Celoron Silent Gears.

BUILDING UP THE LOAD

APPLIANCES, LIGHTING AND POWER • DOMESTIC, COMMERCIAL, INDUSTRIAL

P.G.&E. Sets Up a Housing Program

To tie into the Federal Better Housing Program, the Pacific Gas & Electric Company is conducting a special program of promotion throughout its broad territory in California. This program embraces these ten steps:

1. Interpretation of Federal Housing Campaign to its 500 sales people and managers.
2. Contact with banks and trade groups in each community to co-ordinate with local plans for financing.
3. Program of special window displays in 77 district offices.
4. Promotion in P. G. & E. monthly bulletin to 550,000 customers.
5. Stickers on 600,000 monthly bills.
6. Window and floor display contest among dealers on modernizing electricity, with $100 prize for winner.
7. Co-operative industry program with Pacific Coast Electrical Association and Pacific Coast Electrical Bureau.
8. Specially designed housing modernization poster placed in dealers' stores.
9. Participation in local programs featuring an old home moved into the downtown district and modernized under the spotlight.
10. Co-operative advertising program by dealers in which the company pays one-third the cost.

•

"Liftops" for Minimum Bills

Ohio Public Service Company has made an interesting experiment in converting minimum bill customers to a profitable status by selling them refrigeration. Some 12,000 customers using 360 kw.-hr. annually were selected for the trial. The sales staff was concentrated on this group, no commissions being paid on sales to larger users during this period. The General Electric "Liftop" refrigerator was used as the opening wedge, but salesmen were paid 15 per cent commission on the conventional models against 10 per cent on the "Liftop."

Between July 23 and September 15 they sold 227 "Liftops" and 260 larger refrigerators, also 100 clothes washers, 500 flatirons and many other appliances. The "Liftop" was priced at $86.50 for cash, or $98.90 on terms, payment being $3.50 down and $2.65 a month over 36 months. Units were placed on trial and half the trial installations resulted in the sale of a refrigerator.

The original plan was to launch the drive without advertising or displays. Instead, the selected customers were invited to a private demonstration of this new refrigerator during a limited period, admission by card. But they didn't come. Then the refrigerators were taken to the prospect's door in trucks. They are now being advertised in newspapers, windows and other media.

The company is also continuing to canvass this list with a home assortment of lamps and will follow that with a radio selling for less than $15 and an electric clock. Meanwhile the study of 21,000 non-profit domestic customers has developed a new knowledge of the living conditions and appliance saturation in these minimum bill homes that is expected to be of great value in the further sales activities to these no-profit customers.

Public Service Dramatized

To show its consumers the vast territory that it serves so effectively and economically, the Utah Power & Light Company built this striking display for a recent Home Modernization Exposition held in Salt Lake City. On a large relief map of Utah company engineers built miniature transmission lines of high-resistance wire, duplicating the entire system. Generating stations were indicated by lighted pylons and identified by small labels, as were the towns and cities served by the company.

Every few minutes the lights in the exhibit room were dimmed and the miniature transmission lines energized with sufficient current to cause the wires to glow at a cherry red heat. The effect of the far-flung network of glowing transmission lines in the darkened room dramatized in a most effective manner the extent of the service rendered by the company. The display proved to be one of the most

Map of Utah showing scope of power system

BEST FOOT FORWARD

His best foot goes forward on a rubber heel; a rubber heel shaped in a mold heated with electricity, through CHROMEL heating-units . . . and you put your best foot forward in behalf of increased revenue, when you energetically promote your industrial heating-load on applications of which this one is typical . . . and when you develop your Electric Range load. . . . And may we remind you that this profitable source of revenue was created by the discovery in 1906 of CHROMEL, whose durability today is more than twice that of a few years ago. You act in behalf of yourself and your customer when you specify CHROMEL for the heating-units. For our Heating-Unit Calculator, ask for Form K. W. Hoskins Manufacturing Co., Detroit, Michigan.

HOSKINS

CHROMEL

WIRE

The Wire that made Electric Heat possible

popular in the exposition and visitors expressed themselves as gaining a new appreciation of electric service from having viewed it.

•

New Appliance Drive in St. Louis

Through the first six months of this year the Union Electric Light & Power Company of St. Louis ran a co-operative appliance sales campaign, tying in all dealers through the St. Louis Electric Board of Trade. Wholesalers reported the total of 22,497 refrigerators sold during this period, an all-time high. On all major appliances they showed gains running from 10, 21 and 46 to 130, 178, 183 and 360 per cent increase over the same period of the previous year. On small appliances the same wholesalers showed gains running from 8, 20 and 30 to 66, 100, 201 and 221 per cent. All these appliances flowed through the retail stores. Only one dealer or wholesaler reported a decrease and this was 1 per cent.

With this as a background, St. Louis has launched a new drive, running through October, November and December, which will feature lighting and the full list of appliances. The backbone of the campaign will be newspaper advertising, in which an assortment of a half a dozen separate ads are massed, to occupy about a half-page space. These ads carry the signature "Electrical dealers and contractors of St. Louis and Vicinity" and the name of the Union Electric Light & Power Company. The cost will be financed by the Union company. Special attention will be called to worn-out appliances out of order and unused in homes. Free inspection is offered. Supporting the newspaper display will be a radio program, mail and display material featuring the low cost of operation on the St. Louis rate.

•

Contest to Bring Dealers Prospects

To stimulate range sales by bringing prospects into the stores of the dealers, the Portland (Ore.) General Electric Company is giving away a new electric range every week for five consecutive weeks. The person who adds the best two lines to a two-line jingle which appears in the company's advertisement during the week wins the range. The advertisements are run in the leading papers of the territory and illustrate the gift range, tell of ten advantages in electric cooking and include a coupon for the contest.

Entries must be made on the coupon and submitted only at dealers' stores which display and sell electric ranges. In the first three weeks of the contest from 1,200 to 1,500 jingles were received each week.

The Portland General Electric Company furnishes complete window displays on electric cooking and runs an electric range sales school for the dealer salesmen. As an added inducement for attendance at the sales school, the company is offering three cash prizes for the dealer salesmen who complete the course and turn in the highest number of range sales during the contest. Enthusiastic support is being given by the electrical dealers in the territory.

Globe-Democrat · · · · · Tuesday, October 23
Post-Dispatch · · · · · Wednesday, October 24
Star-Times
(Perfect Home Tabloid Section) · Saturday, October 27
ELECTRICITY
Your cheapest servant
I DON'T WORK LIKE A CHINESE COOLIE TO SAVE 17½ CENTS A WEEK
THAT'S WHAT IT COSTS TO WASH ELECTRICALLY!
ONE HOUR'S WORK
6 BIG RUGS CLEANED!
ONLY ½ CENT PUT ON YOUR ELECTRIC BILL
SIT DOWN AND REST YOUR ARMS!
AN ELECTRIC IRONER WORKS FOR YOU FOR 9/ A WEEK
WITH AN AUTOMATIC IRON YOU DO 3 DRESSES FOR 1½/
THE MORE YOU USE THE CHEAPER IT GETS!
ELECTRICAL DEALERS AND CONTRACTORS OF ST. LOUIS AND VICINITY
UNION ELECTRIC LIGHT AND POWER CO.

Typical display used in the St. Louis co-operative campaign

•

A.G.&E. Companies in Employee Drive

All companies in the American Gas & Electric System launched an all-employee Christmas range and water heater campaign on October 29. Each employee will be given a prospect list and receive a cash bonus, in accordance with his success as a salesman. Salesmen will draw special cash prizes for records against the individual quotas. Four silver trophies will be won by the general manager, division manager, district superintendent and manager of lighting sales whose staff finishes highest on their quota. Extra prizes are offered to employees of accounting, engineering and commercial departments for outstanding sales help.

The campaign will be supported by an elaborate program of employee meetings, program charts, window displays, direct mail and newspaper advertising. Trial installation of electric ranges are recommended to all companies. The campaign will end on Christmas Eve. The quotas call for the sale of 633 ranges and 211 water heaters.

•

Maine Shows Gains in Major Appliances

Up to the middle of October Central Maine Power Company has sold this year 1,370 electric ranges—an increase of about 470 per cent over a year ago. It has sold 1,022 electric refrigerators—an increase of about 70 per cent over a year ago. Based on an average rate of $36 for each range and around $20 for each refrigerator, this means something like $70,000 in added revenue for a twelve-month period. Through the company's policy of turning over all electric range installations to local dealers, more than $41,000 has been paid out to these dealers for range installations.

Some Data on Trial Selling

[*Continued from page 35*]

made to hold them to a minimum. The most serious objection to an unrestricted plan similar to that used by this company is the number of unused range and water heater wiring installations. This number is bound to increase in time unless every effort is made to put them back in service. To limit the number of idle wiring installations, an additional bonus was offered to the district representatives of the company, the water heating bonus being $1.50 and the range bonus $2.50. This has been an effective means of minimizing this difficulty.

Because the costs involved in building load are so important, a careful record was kept of operations under the Trial-Optional Purchase Plan. Table I shows that the net expenditure per unit was $63.07 for a range and $76.57 for a water heater. As indicated, these costs were calculated after all expenses, both capital and operating, of the campaign were included. It may be seen that the magnitude of the trial campaign is such that no item of expense may be omitted without seriously distorting the picture.

Having calculated the expense per unit, it was possible to set the unit revenues and costs for service for each appliance on the yearly increment basis. (See Table II.)

From the merchandising standpoint the trial plan is not Utopian; from the load-building point of view it has unquestionably demonstrated its value. If a rapid increase in gross revenue is the goal, the trial plan is the vehicle. If the financial set-up is sound, the volume of business is satisfactory and the appliances stay in operation the trial plan may be rightfully considered the most effective load-building weapon yet developed. To quote another executive: "We, too, wish we had started it years ago."

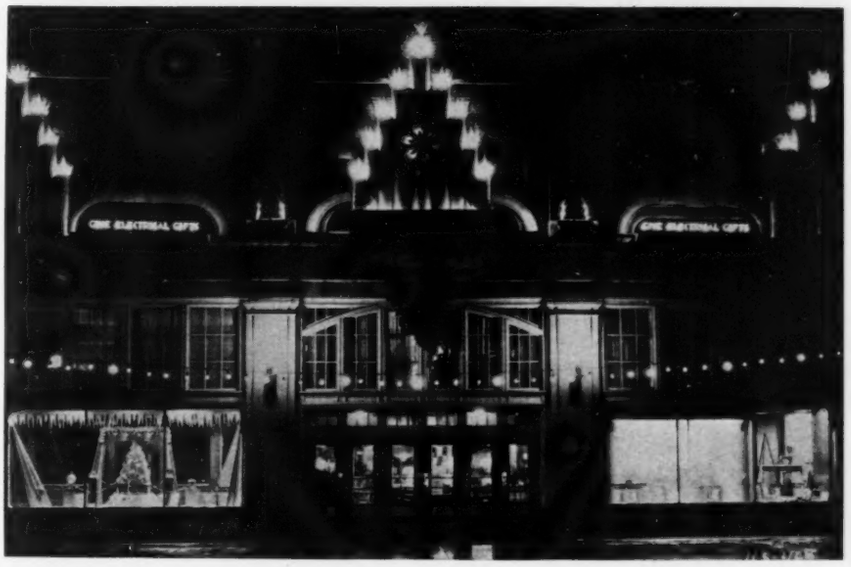
Table II—Summary of Estimated Costs

Range and Water Heater Rentals—Unit Revenues and Cost of Service—Yearly Increment

Item	Range	Water Heater
Kilowatt-hours delivered	1,750	3,600
Revenue	$35.00	$36.00
Cost of Service		
Sales, etc., cost amortized over seven years for range, twelve years for water heater	$5.04	$3.53
Total additional operating costs opr., maint., dep., taxes—15%	4.88	5.75
*Generation cost (fuel)	6.69	13.75
*Billing, meter reading, etc.	1.00	2.50
*Servicing appliance (estimated)	2.00	1.00
Uncollectible bills (1% gross)	0.35	0.36
Energy tax (3% gross)	1.05	1.08
Total expenses and taxes before income tax	$21.01	$27.97
Balance before income tax	13.99	8.03
Federal income tax at 13¾%	1.92	1.10
Net return per appliance	$12.07	$6.93

*Increment cost.

USE PAST EXAMPLES TO STIMULATE OTHERS



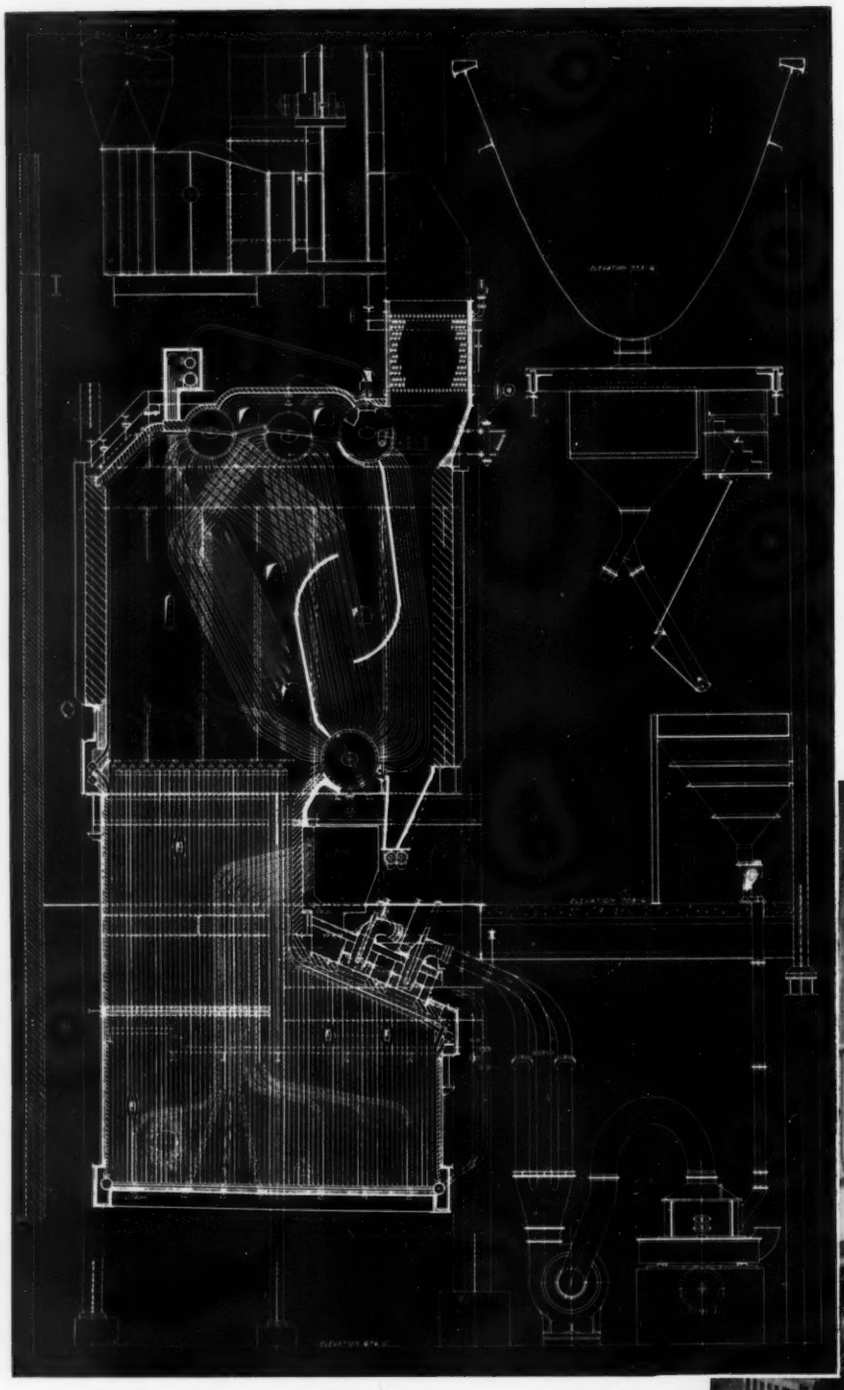
Unique exterior decorations of department store incite the interest of the community and encourage participation by all

The store, dressed in decoration attire, heralds the Christmas season and attracts the attention of all

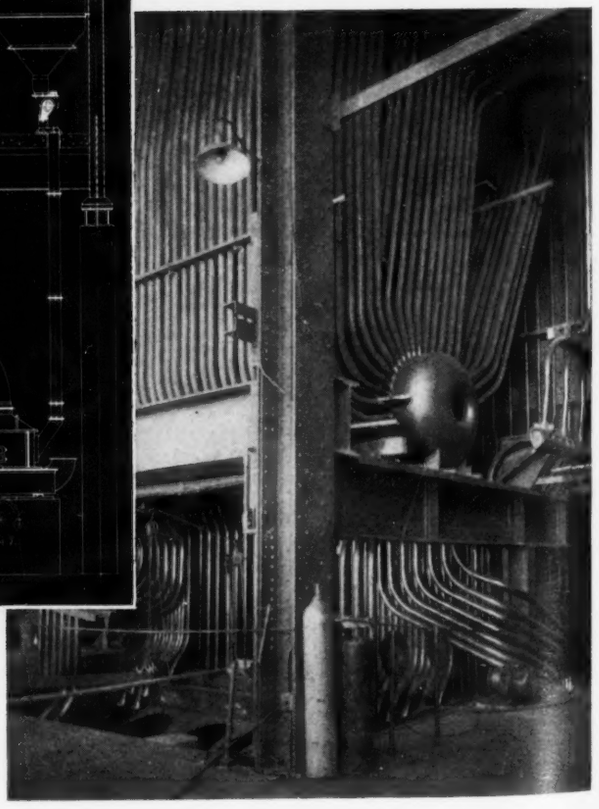
Festive lighting attracts crowds to business sections at night. Coupling attractively lighted show-window displays with this, merchants can draw prospects into their stores, where light properly used can help sell their products.

Right now the problem is to give merchants some ideas on how they can arrange some distinctive Xmas lighting. Illustrations of attractive decorations that have been used elsewhere may give them ideas. Ways in which the electrical work can be executed can be suggested by utility and equipment manufacturers' representatives. — *Dean Warren, Nela Park, Cleveland.*

New C-E Unit



C-E steam generating unit installed in Picway Station of Columbus Railway, Power & Light Company. Designed for continuous output of 300,000 lb. of steam per hr. at 400 lb. pressure and 710 F. at superheater throttle. Unit comprised of C-E Bent Tube Boiler, Design VA, (18,300 sq. ft. heating surface), Elesco Superheater, C-E Economizer, Ljungstrom Air Preheater, C-E Slag-Tap Furnace, C-E Water Walls, and C-E Direct Fired Pulverized Coal System. Engineering by the United Light & Power Engineering & Construction Company.



Construction view. An interesting aspect of this installation is that the work of removing the old boiler and installing the new one had to be done in a space 26½ ft. by 29 ft. without interruption of plant service.

COMBUSTION

at Picway

300,000 lb. steam generating unit at Picway Station of Columbus Railway, Power & Light Company is performing in entire accord with specifications

THE recent C-E installation at Picway is a good example of the advantages, economic and operating, that are available through the replacement of existing boiler equipment with units designed in the light of present-day knowledge and experience.

The Columbus Railway, Power & Light Company found it desirable to shift load from another of their generating stations to their Picway plant, which contained two 30,000-kw. turbine-generators and six 14,700 sq. ft. boilers designed to operate at 350 lb. steam pressure and 710 F. at the superheater outlet.

Analyses indicated that if one of the 30,000-kw. turbine-generators were to be operated at increased pressure and temperature there would result an estimated saving of approximately $20,000 per year on this item alone. However, it was not found feasible to reconstruct the existing steam-generating units to meet the proposed new steam conditions.

Therefore, in order to effect this saving and at the same time secure increased boiler capacity, it was decided to replace the sixth boiler by a new unit designed to carry the entire load of one of the 30,000-kw. turbine-generators, and capable of a continuous output of 300,000 lbs. of steam per hr. at 400 lb. operating pressure and 750 F. at the superheater outlet. The new unit, illustrated on the opposite page was furnished in its entirety by Combustion Engineering. It has now been in operation several months and is performing up to expectations.

• • •

The changing picture of present and prospective load conditions makes it advantageous for many utility systems to review past studies or undertake new ones in order to determine how modernization or replacement of existing steam generating facilities may be effected so as to assure maximum improvement in present operating economy while providing adequately for prospective increases in system load. In connection with such studies C-E engineers, by reason of the extent and variety of their experience with similar problems, are qualified to render valuable cooperative service to central station engineers and their consultants.

C-E

COMBUSTION ENGINEERING COMPANY, INC.

200 MADISON AVENUE, NEW YORK, N. Y. Canadian Associates, COMBUSTION ENGINEERING CORPORATION LTD., Montreal

A-196

BOILERS — STOKERS — PULVERIZED FUEL SYSTEMS — FURNACES — AIR HEATERS — ECONOMIZERS

Complete steam generating units of standard overall design or comprised of any combination of boiler and firing equipment

ENGINEERING

IT IS SAFE TO BUY ON

Mechanical excellence

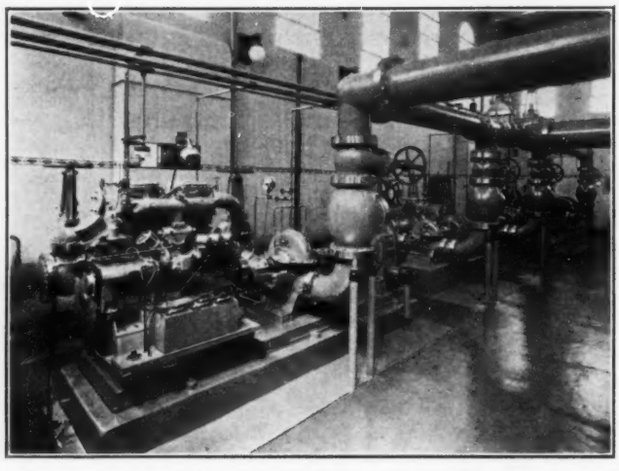
Past performance

Responsibility of the manufacturer

Price (which should be least important).

Judged by any standard,
Sterling engines qualify.

Sterling High Duty — Internal Combustion Engines



Two Sterling GRC-4 cylinder, 120 H.P. engines, 1200 R.P.M., are direct connected to DeLaval cent. pumps and serve as standby units at El Centro, Calif.

STERLING ENGINE COMPANY

Home Office and Plant
1270 Niagara St.,
Buffalo, New York

Dept. C-2

Branch Office
900 Chrysler Bldg.,
New York, N. Y.

Associated Builds Revenues by Appliance Sales

As the result of its promotional efforts in the sale of electricity and gas, the new-business department of the Associated Gas & Electric System obtained business in 1933 estimated to produce revenue of $5,631,146. This new business helped materially to offset large declines in revenues brought about by lower rates, losses of customers and curtailment of service by existing customers. About $2,800,000 of this estimated annual revenue was obtained through domestic customers.

During the year sales by dealers and the system to domestic customers added 30,000 electric refrigerators, 3,000 electric ranges and 1,500 electric irons.

•

Great Britain to Hold Electrical Convention

British electrical interests have decided to hold a National Electrical Convention in 1935—a novelty to the British industry. The convention week is scheduled to commence June 17, 1935. Many people in the industry are urging London as the only place for holding a conference of such importance and are also supporting the idea of organizing a giant electrical exhibition at the same time. The convention is, however, according to present plans, to take place at Folkestone.

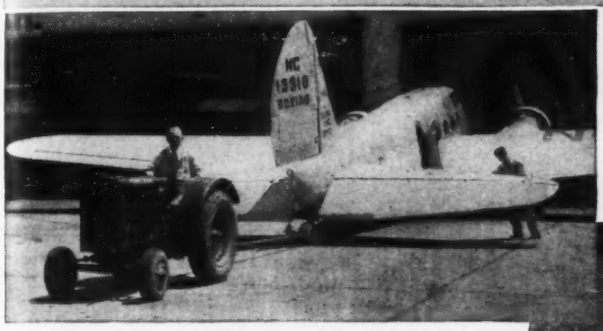
Associations identified with the organization of the convention include the three power company associations, namely, the Provincial Electric Supply Association, the Incorporated Association of Electric Power Companies and the London Electric Supply Association; the Electrical Development Association; the Incorporated Municipal Electrical Association and the Electrical Contractors' Association. The British Electrical & Allied Manufacturers' Association is also participating and so are the Electrical Association for Women, the Institution of Electrical Engineers, the Electrical Wholesalers' Federation, and representatives of both the British Electricity Commission and the Central Electricity Board.

•

Graybar of Seattle Gets Grand Coulee Order

Graybar Electric Company, Inc., Seattle, has secured the contract for 1,500 Wesix, fan-type, electric heaters to be installed in several hundred homes being built for workmen employed in the construction of the Grand Coulee Dam. The award was made by the Mason-Walsh, Atkinson, Kier Company, general contractors for the $63,000,000 dam project. The order will approximate $40,000.

See What Others Are Doing with this Versatile Power



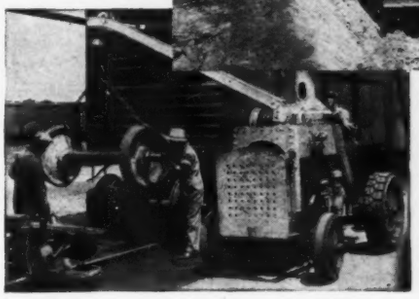
Above: The new McCormick-Deering Model I-12 industrial tractor, maneuvering a giant of the air at a municipal airport. This compact tractor offers speeds of from 2½ to 10¼ m. p. h., and ample power for airport, park, estate, and golf course (Fairway 12) requirements.

Backed by the **WORLD'S LARGEST TRACTOR BUILDER** *and a Country-wide Network of* **McCORMICK-DEERING SERVICE**

Above: The T-20 TracTracTor in a logging operation. The round hand-hole plates visible at the rear are a feature of TracTracTor accessibility.

Above: The Model I-12 industrial tractor hauling a train of lumber dollies. Here is efficient power for railroads, lumber yards, woodworking shops, etc.

Above: A leading brewery moves freight cars and performs many other tasks with this powerful Model I-30 industrial tractor.



Above: The McCormick-Deering Model T-40 TracTracTor at work on a dirt road job. This big crawler provides ideal power for road building and maintenance work, including snow removal.

At Left: A railway company uses this crane-equipped Model I-30 industrial tractor in maintenance work.

Above: A 25 h. p. power unit installation in the oil country. This efficient engine operates on natural gas and pumps three wells simultaneously.

Above: This T-40 TracTracTor and bull-dozer outfit helps to operate a strip coal mine profitably. Built with 6-cylinder gasoline engine and 4-cylinder Diesel engine.

BUSINESS MEN are studying power costs today as never before. Burdens that had to be shouldered by industry in other days are being sidestepped with increasing frequency by men who have discovered this key to economy—*McCormick-Deering Power.*

Perhaps you have a power job that needs analyzing . . . that can be done better with *McCormick-Deering Power.* If so, the nearby McCormick-Deering distributor or International Harvester branch will be glad to consult with you.

McCormick-Deering Power is available in the form of power units, wheel tractors, crawler tractors, and modifications of these types.

Above: A 35 h. p. power unit operating a saw mill. Hundreds of outfits like this are at work, with good records to their credit.

Above: A McCormick-Deering-powered locomotive . . . an ideal unit for use in mine, quarry, clay pit, sand and gravel pit, etc.

Above: A 52 h. p. Diesel power unit operating a big gravel plant at remarkably low cost.

INTERNATIONAL HARVESTER COMPANY
606 So. Michigan Ave. **of America** *(Incorporated)* **Chicago, Illinois**

Write for specific information on industrial power and equipment.

At Left: The radio-controlled tractor featured in the International Harvester exhibit at the World's Fair, Chicago, performing before the news-reel camera. The compact design and short-turning radius of the "12" series tractors are emphasized in this driverless demonstration.

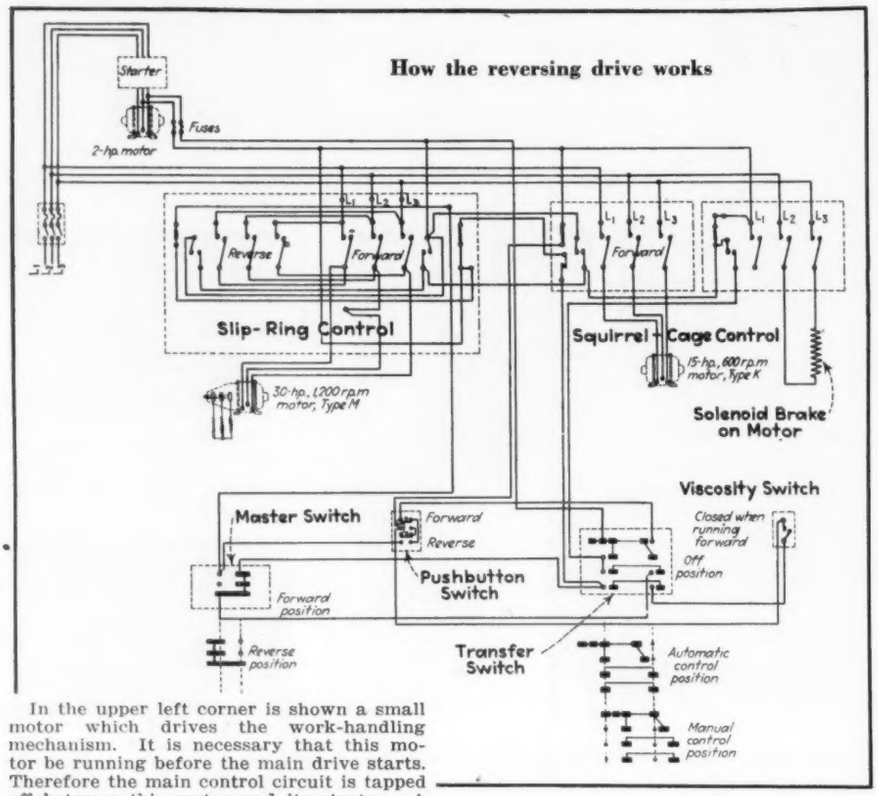
McCORMICK-DEERING INDUSTRIAL POWER

High-Speed Reversing Drives

[*Continued from page 31*]

diameters of rotors so as to cut down the inertia of rotation and thus lighten the heat load resulting from rapidly recurring accelerations and decelerations as well as to shorten the time required for them. As explained in this article, much has already been done in this way by the change from the ordinary two-speed squirrel-cage motor, which was the first form of the drive, to the two-motor combination with smaller rotor diameters. Probably means will also be found to incorporate the two motors into a single frame, with a consequent saving in space requirement. As with all other equipments for electricity application, the present form of the fast reversing drive is just a stage of development on which will be built the changes and improvements of the future.

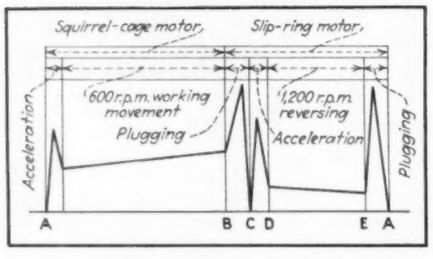
How the reversing drive works



In the upper left corner is shown a small motor which drives the work-handling mechanism. It is necessary that this motor be running before the main drive starts. Therefore the main control circuit is tapped off between this motor and its starter. A transfer switch is provided so that control can be made manual with forward and reverse push buttons for inching while the machine is being set up for production. The "master switch," lower left, is the reversing switch which is mounted on the driven machine. This is a heavy-duty spring-operated device which flips back and forth at the end of tool movement. The "solenoid brake" at the right is actually a gravity brake held open by a holding coil while the drive is working. Immediately below it is an oil-viscosity switch which is closed when the drive is running forward. The control-circuit auxiliary contacts are mechanically connected to, and operate with, their associated main contactors.

Following through an operating cycle, let us say that the squirrel-cage motor is running. At the end of the forward movement the master switch flips over and the reverse contactor of the slip-ring motor closes as the contactor for the squirrel-cage motor drops out. At the end of the reverse travel the master switch flips to the other side and the forward contactor of the slip-ring motor closes as its reverse contactor opens. The drive is brought to rest by this plugging and immediately starts in the forward direction. As it does so the viscosity switch closes the contactor of the squirrel-cage, motor which through its auxiliary contact opens the forward contactor of the slip-ring motor. Reference to the work cycle graph will help to visualize the sequence of operations.

The work cycle analyzed



This graph is only typical and has no direct relation to any installation. It is purposely distorted to show more clearly the characteristics of the fast-reversing drive. Referring to the master switch on the wiring diagram, this switch on the driven machine is in position at point "A" on work-cycle chart to close the contactor of the squirrel-cage motor. This motor accelerates and works up to the point "B" when the master switch flips to the other side, opening the squirrel-cage motor contactor and closing the reversing contactor of the slip-ring motor. The drive is thus plugged to a stop from "B" to "C," accelerates in the reverse direction from "C" to "D" and continues backward to "E." At "E" the master switch flips back to its first position, opening the reverse contactor and closing the forward contactor of the slip-ring motor, plugging from "E" to "A." As the drive comes to a stop and makes a fraction of a revolution forward at "A" the viscosity switch closes, closing the contactor of the squirrel-cage motor and opening the forward contactor of the slip-ring. The practically simultaneous operation of these two contactors (one closing and the other opening) is accomplished by the movement of the auxiliary contact shown closed in lower left corner of squirrel-cage control. Closure of the squirrel-cage motor contactor opens this auxiliary contact and de-energizes the holding coil of the forward contactor on the slip-ring motor.

Profitable Year Predicted for Washer Industry

Household washing machine shipments in August totaled 111,808 units, which represents an increase of 30 per cent over the preceding month, according to an announcement made by J. R. Bohnen, secretary of the American Washing Machine Manufacturers Association. Shipments for the first eight months of 1934 were 877,251, or 35 per cent more than the same period in 1933. August shipments of home ironing machines continued the unprecedented growth they began displaying consistently last winter, totaling 11,030, compared to 8,682 in the preceding month and 7,812 in August, 1933. Ironer shipments thus far are 86 per cent ahead of the same period in 1933.

"Unless every indication fails, this will be the greatest year in the washer industry's history," said Secretary Bohnen. "The total this year probably will reach 1,250,000, as compared to slightly more than 1,000,000 last year.

•

Heater Sales Promise Fourfold Increase in 1934

Billed sales of electric water heaters reached a peak in May and June, declining later in the summer, according to statistics of the N.E.M.A. based on reports of eleven companies. August sales amounted to 2,381 units of all types, with an aggregate value of $112,258 including accessories and parts. As shown in the accompanying table, 26,186 units were sold during the first eight months of the year. For the corresponding period of 1933 it was announced that 8,662 units had been sold. Because more companies are now reporting the figures are comparable to the extent of showing a very considerable increase though they cannot be used to measure its magnitude.

Month, 1934	Number of Units — Storage	Number of Units — Side Arm and Auxil.	Value Incl. Access.
January	1,010	546	$55,919
February	963	688	55,848
March	1,651	459	92,394
April	2,539	768	138,716
May	4,724	1,433	258,923
June	4,679	1,100	239,943
July	2,732	513	156,175
August	1,883	498	112,258
	20,181	6,005	$1,110,176

Something's gone wrong in Denver!

WHEN temperatures, pressures or levels rise or fall in Denver, or at any other place a few feet or a thousand or more miles from headquarters, Bristol's Metameter records it instantly. A 12-inch chart right before your eyes keeps a continuous record of every fluctuation at the distant point. Any change from normal, whether alarmingly abrupt and large or minute and gradual, is immediately and permanently recorded.

The latest development by the pioneers in telemetering, Bristol's Metameter enables you to control process conditions or operations no matter how distantly conducted. It consists of a transmitter at the location where the temperature or pressure is being measured, an electrical circuit for conveying the impulses automatically sent out by this transmitter, and a recording instrument at headquarters for mechanically translating the impulses received into the continuous charted record.

The *durations* and not the *intensities* of the transmitter impulses are proportional to the values measured. Only a simple two wire circuit is needed. Where available any existing telephone line may be employed without danger of interference with or from conversation carried, inductance or line capacity.

In addition to the large easy-to-read chart, notable features are the use of any kind and frequency of line current, small line current and voltage, freedom from interference by changes in voltage or other line conditions, no exposed contacts, small power consumption, synchronous power sources unnecessary, Bristol's standard measuring elements, self-checking accuracy, self-restoring, and applicability to remote control.

Interesting details are given in a bulletin now on the press. Write for your copy.

THE BRISTOL COMPANY ~ WATERBURY ~ CONNECTICUT

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METAMETER

FOR TELEMETERING

WOLVERINE SOLDERING LUGS

More Contact Area
More Capacity
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For Over-head and Underground Improved Designs

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RELIABILITY

Electrical and Mechanical

J-D PORCELAIN INSULATORS

J-D Porcelain Insulators—Suspension, Switch and one-piece, high-voltage pin types—combine high mechanical and electrical strength with reliability. Also, Strain Insulators, Bushings, Special Shapes and a complete line of Insulator Hardware.

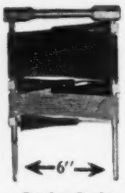
Lines all over the world testify to J-D QUALITY.

If you are a J-D user, CONSULT THE RECORD—if not, CONSULT US.

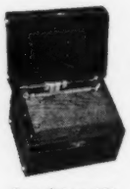
THE JEFFERY-DEWITT INSULATOR CO.
KENOVA - - - - - W. VA.

GROUNDOMETERS

For reading, directly and without calculations, the resistance of an earth electrode regardless of the resistance of the reference probes.



Duplex Probe



Complete outfit

BORDEN ELECTRIC CO.
Summit New Jersey

"ANVIL" BRAND BLOCKS

Linesmen find
"Perfect"
Metal Block
gives best service.

Send for Catalog E.W. covering full line.

Western Block Co.
Lockport, N. Y.
NEW YORK CITY
74 Murray St.
CHICAGO
34 N. Clinton St.

Spends on Boiler to Save on Fuel

[*Continued from page 26*]

be started and the burner lighted and in operation in less than two minutes. On this particular occasion the mills were started in sequence instead of simultaneously as they might have been, and even then the total time elapsing between starting the mills and shutting off the gas was only eight minutes. The reverse operation merely required cutting in the gas and letting the mills run empty before shutting them down.

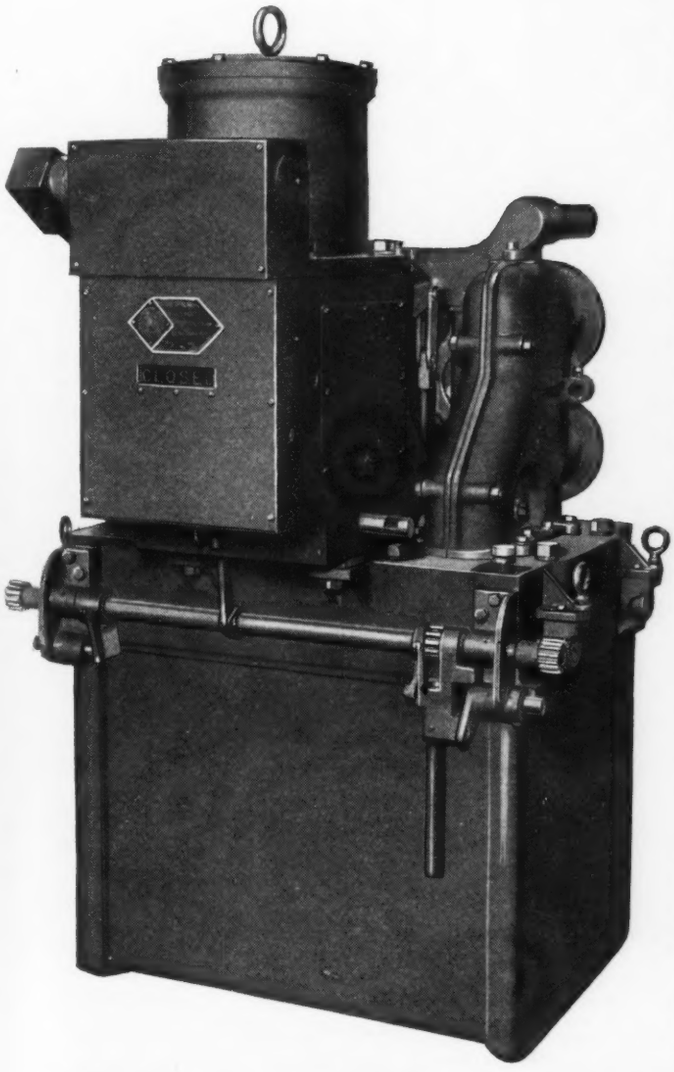
So far only the one boiler has been changed over to pulverized coal firing. This boiler has operated more than 90 per cent of the time during the past year, generating well over half of the total plant steam requirement, and so long as the load remains as it is there is small reason to undertake an additional expenditure that has for its object the betterment of coal economy. For it is difficult, practically impossible, in fact, to justify large spending for performance improvement when the gap between reasonably possible and actual plant outputs is still much too wide for comfort.

A MILE OF ARC WELDING

Approximately 3,800 ft. of arc welding went into the fabrication of the stator frame alone of one Boulder Dam generator at the Schenectady Works of the General Electric Company. The rotor frame accounted for another 900 ft., making a total of nearly a mile of welding in a single machine. The generator is rated at 82,500 kva.

★ Less Arcing Time
★ Lower Maintenance
★ Wider Application

Expulsion Port Breakers



AS a result of several years of testing and experimental work, Allis-Chalmers engineers have developed an improved type of oil circuit breaker for use in Armorclad Switchgear. This Expulsion Port Breaker, although not differing greatly in mechanical construction from previous Allis-Chalmers designs, has incorporated in it an arc extinguishing principle which makes it very much more efficient.

ADVANTAGES OF THE EXPULSION PORT BREAKERS

1—Arc interruption is accomplished much easier and with lower internal pressures and consequently the factor of safety of the breaker is greatly increased.

2—These breakers are oil tight and do not throw any oil under service conditions.

3—The oil deterioration and contact deterioration is enormously less than in a standard breaker, which means that the maintenance required by these breakers is very much less than previously necessary.

4—The arcing time of these breakers is materially shorter and consequently the short-circuit interruption is attained quicker.

5—These breakers are not sensitive to variations in current value and therefore are efficient as arc interrupters through a wide range of current. This enables the breaker to be applied on various service voltages with the assurance of the same interrupting performance as at the rated voltage.

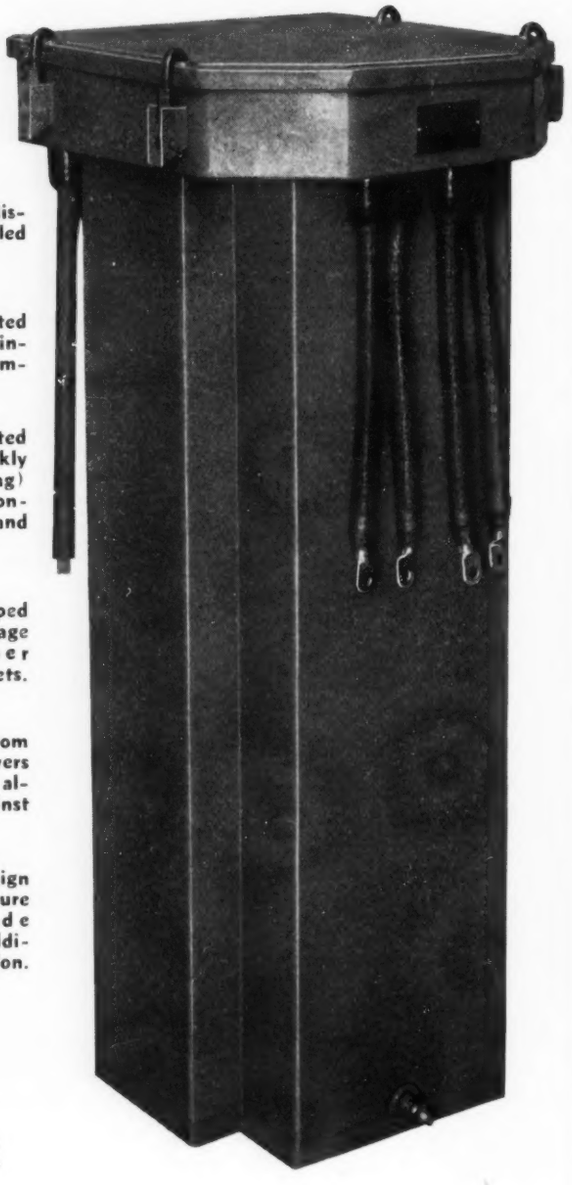
Armorclad switchgear is designed by engineers with 28 years of metal-clad experience behind them and the best of engineering laboratories in which to develop and test new designs. It provides the maximum of safety, reliability, performance and dollar value.

ALLIS-CHALMERS

— Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin, U.S.A. —

A modern

DISTRIBUTION TRANSFORMER



ADVANTAGES:

- May be completely dismantled and reassembled with a wrench.
- Coils vacuum impregnated in varnish—superior insulation to usual compounds.
- Bushings of coordinated flashover type — quickly replaced (no soldering) yet incapable of syphoning oil — splashproof and weatherproof.
- Transformers are shipped filled with oil — leakage prevented by proper cover and pocket gaskets.
- Tanks fabricated from copper-bearing — covers cast from nickel-iron alloy — insurance against rust.
- Coils of rugged design with low temperature gradient to provide proper cooling and additional overload protection.

AMER TRAN

FOR A THIRD OF A CENTURY

AMERICAN TRANSFORMER COMPANY

170 Emmet St. . . . . Newark, N. J.

Most Manufacturers Now Filing Prices

Fifteen of the twenty-one subdivisions of the electrical manufacturing industry are now operating under the published price system as established by the N.E.M.A. Code. They include appliances, construction materials, dry batteries and flashlights, electric tools, illumination, industrial apparatus, installation devices, radio receiving tubes, radio transmission and public address, roughing-in material, specialties, telephone manufacturers, transmission and distribution, wire and cable and X-ray and electro-medical.

•

Burner Sales Outrun 1933

Shipments of oil burners in the United States during the first eight months of the year were 14 per cent greater in 1934 than in 1933, 47,421 against 41,626. The excess came chiefly in the three spring months. August shipments, 11,085, were off 5 per cent compared with 1933 and July shipments, 6,272, were off 16 per cent.

Domestic burners using mechanical draft were by far the predominant type, shipments in August accounting for 8,642, in July 4,705 and in August, 1933, 10,445. The figures are based on data reported to the Bureau of the Census by 149 manufacturers.

•

Superheater Gross Income Totals $521,757

Congressional legislation to aid the railroads is urged by the Superheater Company in a recent statement to stockholders. Exclusive of its Canadian affiliate, the company reported a gross income of $521,757 and a net income of $378,120 in the nine months ended September 30. "No longer can the fact be ignored," the statement said, "that normal economic conditions can only be restored by stimulating the durable goods industries, of which your company and its associated properties are a part. Since the railroads are the largest single purchaser of durable goods, it is obvious that prompt and vigorous action should be taken to assure them increased earnings and purchasing power . . . "

•

Kelvinator Sales

Sales by Kelvinator Corporation during the company's fiscal year recently closed were 34 per cent greater in dollar volume than those for the previous year and 42 per cent in excess of 1932 sales, H. W. Burritt, vice-president in charge of sales, has announced.

Building Up Appliance Loads

Saturation ratios above 25 per cent have been attained in refrigeration and electric cooking — Expansion to like levels in other cities will absorb 2,000,000 refrigerators, 4,000,000 ranges

POSSIBILITIES in the way of domestic load building are given definite form by the results of a recent survey of 63 cities. The survey was made by the Real Property Unit, Bureau of Foreign and Domestic Commerce, and figures for each of those cities, which are scattered throughout the nine geographical divisions, have now been announced. The accompanying summary gives regional totals and averages. For data on individual cities, reference should be made to the bureau's report. Separate figures are given for lighting, cooking and mechanical refrigeration.

As to the first of these uses of electricity, the saturation runs well above 90 per cent except in the Southern cities. Comparison of the percentages using electricity with those using neither gas nor electricity leaves, in most cases, a small residium apparently using gas for lighting. The largest proportion of users of electricity was found in Seattle, 98.5 per cent, but Worcester, Mass.; Lansing, Mich., and Butte, Mont., were close behind with 98.3 per cent. The lowest was Charleston, S. C., 49.8 per cent. Low ratios in the South are to be expected.

It is in electrical cooking that the widest variations are found. Regional averages for the cities surveyed ran from 17.4 per cent on the Pacific Coast to 0.3 per cent in the West South Central and 0.4 per cent in the Middle Atlantic. Boise, Idaho, has the highest city average, 29.6 per cent; Seattle is next, with 27.9 per cent.

Mechanical refrigeration, in contrast, has been widely adopted. The regional averages all lie between 10 and 20 per cent; fourteen of the cities exceed 20 per cent, led by Lincoln, Neb., with 27.5 per cent, and only four fell below 10 per cent.

The report gives averages also for the entire group of 63 cities, but these are not closely representative of the average for the country as a whole, because they give too much weight to some parts of the country and not enough to others. For example, the survey covered 15 per cent of the number of homes in the New England and the Pacific states, but only 3 per cent in the Middle Atlantic and 4 per cent in the East North Central, two great sections that together comprise more than two-fifths of all homes in the United States. In these regions a good balance could only have been had by including some of our largest cities, a formidable task which, wisely, was not undertaken: the work on any one of these would have been equal to the entire present survey.

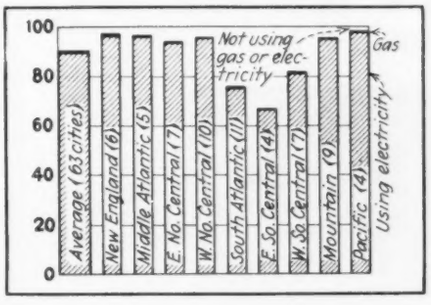
What are the possibilities?

Statistics are of little use, except as a basis for action. They are costly to collect. When available, full advantage should be taken of them.

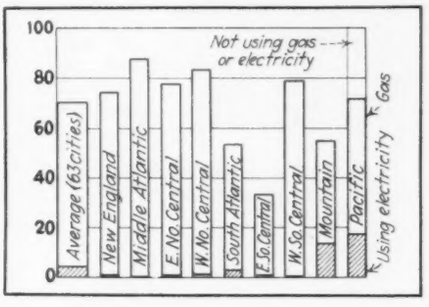
So far as numerical connections are concerned, the lighting load in most localities is pretty close to saturation. The relatively few homes not now served are presumably at the lower end of the economic scale. They cannot afford even the modest expense of electric light. If connected, they would be served at a loss. "Better light, better sight" and more use of

[*Continued on page 99*]

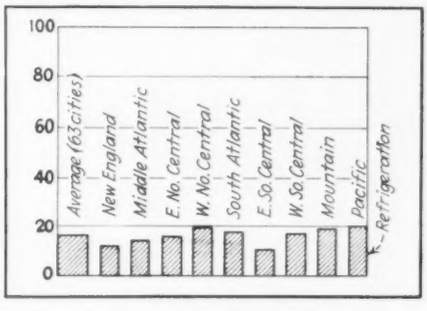
Using electricity for lighting



Using electricity for cooking



Provided with mechanical refrigeration



Percentage of dwelling units with electrical facilities

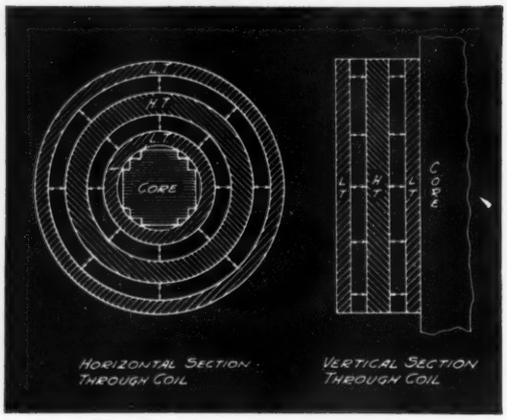
Additions to Bring All Regions to Best Present Level of Use

Geographical Divisions	Non-farm Homes	Additional for 20% Cooking: Per Cent	Additional for 20% Cooking: Number	Additional for 25% Refrig.: Per Cent	Additional for 25% Refrig.: Number
United States.	23,300,026	....	4,010,000	....	2,059,000
New England.	1,865,221	18.9	352,000	12.8	239,000
Mid. Atlantic.	5,989,263	19.6	1,175,000	10.3	618,000
E. No. Central	5,319,267	19.1	1,020,000	8.9	473,000
W. No. Central	2,179,746	18.7	408,000	5.2	113,000
So. Atlantic...	2,365,102	16.8	397,000	7.3	173,000
E. So. Central.	1,184,647	19.0	225,000	14.3	170,000
W. So. Central	1,723,751	19.7	340,000	7.8	134,000
Mountain.....	661,479	6.2	41,000	6.0	40,000
Pacific.....	2,021,550	2.6	52,000	4.9	99,000

Electrical Facilities in Selected Cities

Geographical Divisions	Number of Cities	Total Structures	Number of Dwelling Units	Dwelling Units: Lighting Facilities: Using Electricity (Per Cent)	Dwelling Units: Lighting Facilities: No Gas or Elec. (Per Cent)	Dwelling Units: Cooking Facilities: Using Electricity (Per Cent)	Dwelling Units: Cooking Facilities: No Gas or Elec. (Per Cent)	Dwelling Units: Having Mechanical Refrigeration (Per Cent)
Totals.....	63	1,728,486	2,313,955	89.6	9.9	4.4	29.4	16.9
New England....	6	173,688	304,126	96.7	2.6	1.1	25.7	12.2
Mid. Atlantic....	5	125,475	185,715	96.2	3.2	0.4	12.1	14.7
E. No. Central...	7	194,424	243,887	93.6	6.0	0.9	22.3	16.1
W. No. Central..	10	305,530	400,610	95.6	4.1	1.3	16.7	19.8
S. Atlantic.....	11	253,227	343,417	75.4	24.0	3.2	46.6	17.7
E. So. Central....	4	129,220	154,447	66.8	33.0	1.0	66.3	10.7
W. So. Central...	7	181,256	215,827	81.3	18.2	0.3	20.8	17.2
Mountain.....	9	89,266	114,847	94.6	5.0	13.8	45.1	19.0
Pacific.....	4	276,400	351,079	97.7	2.0	17.4	28.0	20.1

BALANCE



Section of Pennsylvania Circular Coil showing balancing of short circuit stresses. (All Pennsylvania Distribution Transformers have CIRCULAR coils.)

THE tendency toward low impedence in distribution transformers brings to the front the importance of a transformer coil which maintains its shape under heavy short circuits. Pennsylvania's Circular Coil offers this distinct advantage, because, being circular in shape, it is radially and axially balanced against short circuit stresses.

The proper distribution of stresses eliminates excessive strain in any part of the coil and prevents stretching of wire and possible cracking of insulation.

It is well to remember that short circuit stresses are inversely proportional to the square of the impedance, and, under certain conditions, may attain dangerous proportions. Good engineering, therefore, dictates the use of circular coils in all low impedance distribution transformers.

All Pennsylvania Transformers have Circular Coils.

●

PENNSYLVANIA TRANSFORMER CO.
1629 Island Ave., N. S., Pittsburgh, Pa.

PENNSYLVANIA TRANSFORMERS

DISTRIBUTION AND POWER

Potentials from Insulators

[*Continued from page 34*]

age and also a high-voltage fuse and protective resistor to prevent damage due to possible flashovers. This equipment is shown in Fig. 9. Any one of these measures should be sufficient to afford satisfactory protection, but the combination is used to preclude any possibility of failure.

To obtain correct operation of this equipment a few precautions in the assembly are essential:

First, the conductor between the voltage tap on the insulator and the grid of the vacuum tube must have a very low admittance to ground. The insulation resistance must be at least above two megohms, and the capacitance must be small by comparison with the capacitance of the insulator string. This precludes the use of any great length of underground cable. The most practical arrangement has been found by experience to be an outdoor installation of the vacuum tube equipment, as close as possible to the potential tap. The lead to the grid can then be open wiring and can be brought down in such a way as to shield it from electrostatic fields.

Secondly, if the equipment is to be used for synchronism indication, the lead-in wires to all equipment used for this purpose must have the same capacitance and resistance. The latter factor can be adjusted by suitable resistors, but the former must be accomplished largely by keeping the leads of equal length. Small adjustments can be made by means of variable air condensers.

In the design of the apparatus mentioned in the foregoing discussion the factor of low initial cost has been given first consideration. More accurate or more versatile potential equipment may be obtained at a higher cost, but such expensive equipment will not be justified in those marginal applications where the need is not sufficiently great. A tabulation showing the relative cost and the comparative advantages and disadvantages of the various types of potential equipment is presented on page 34.

The potential indicating equipment described herein fills a definite need in the general operating scheme of a power utility and its application merely depends upon the proper determination of the economic factors involved. Six units are in service and more are planned for the near future.

MORE IMPORTANT THAN ANY MATERIAL THING

MORE important than millions of telephones and millions of miles of wire is the fundamental policy of the Bell System. It is founded on a spirit of fair dealing with the public, with employees and with those who have invested their money in the business.

• • •

"The fact that the responsibility for such a large part of the entire telephone service of the country rests solely upon this Company and its Associated Companies also imposes on the management an unusual obligation to the public to see to it that the service shall at all times be adequate, dependable and satisfactory to the user. Obviously, the only sound policy that will meet these obligations is to continue to furnish the best possible telephone service at the lowest cost consistent with financial safety. This policy is bound to succeed in the long run and there is no justification for acting otherwise than for the long run. . . .

"Earnings must be sufficient to assure the best possible telephone service at all times and to assure the continued financial integrity of the business. Earnings that are less than adequate must result in telephone service that is something less than the best possible. . . . The margin of safety in earnings is only a small percentage of the rate charged for service, but that we may carry out our ideals and aims it is essential that this margin be kept adequate. . . . This is fundamental in the policy of the management."

Quoted paragraphs from an address by Walter S. Gifford, president of the American Telephone and Telegraph Company, at Dallas, October 20, 1927.

BELL TELEPHONE SYSTEM

MEN OF THE INDUSTRY

Indiana Utility Announces Operating Changes

Major promotions in the organization of the Northern Indiana Public Service Company were announced last week by Dean H. Mitchell, vice-president and general manager.

C. V. Sorenson, Indianapolis, has been named general sales manager. He has been merchandise sales manager of the Public Service Company of Indiana. Formerly manager of the old Interstate Public Service Company at Attica, he entered the utility field in 1914.

On the electrical side of the utility's operations, Mr. Mitchell named David L. Bement, Hammond, general electric superintendent in charge of production, transmission and distribution for the entire system. He was promoted from technical assistant to his new position.

E. D. Anderson, Hammond, will retain his title of service manager for the system, his duties being broadened considerably in his new capacity in assisting Mr. Mitchell.

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H. P. J. Steinmetz Heads E.E.I. Sales Committee

H. P. J. Steinmetz, general sales manager of the Public Service Electric & Gas Company, Newark, N. J., has been appointed chairman for the sales committee of the Edison Electric Institute by President Thomas N. McCarter. Mr. Steinmetz has been associated with the Public Service Electric & Gas Company since 1907, when he entered its employ following graduation from New York University. He advanced gradually in the ranks, holding various positions in the auditing and commercial departments both in the general office at Newark and as a field representative at Camden, N. J. In 1931 he was named general sales manager.

Mr. Steinmetz has been active in the dealer co-operative work in towns served by Public Service and has been a member of the sales committee of the institute since its formation.

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► L. L. Robinson, formerly electrical engineer for the Borough of Hackney, London, England, has joined the staff of May & Hawes, consulting engineers, Westminster.

► J. E. Beamguard, a member of the South Carolina Commission since 1928, has been elected chairman of that body to succeed the late Thomas H. Tatum. B. J. Pearman, a member of the commission since 1931, has been made vice-chairman.

► Harold E. Ayer has been appointed manager of power sales for the Lynn (Mass.) Gas & Electric Company, to succeed the late Henry I. Laumann. Mr. Ayer was formerly connected with the Westinghouse Electric & Manufacturing Company at East Pittsburgh and more recently with the sales staff of the Hartford Faience Company.

•

Three New Vice-Presidents Named by Westinghouse

Roscoe Seybold, formerly controller of the Westinghouse Electric & Manufacturing Company, has been elected a vice-president of the company. William G. Marshall, formerly assistant vice-president, and Ralph Kelly, formerly director of the budget, were also made vice-presidents. Mr. Seybold has been continuously in the service of the Westinghouse organization since 1907. Prior to his appointment as assistant to Vice-President T. P. Gaylord, Mr. Marshall spent three years as director of personnel for the Philadelphia Company and affiliated corporations. Mr. Kelly has been identified with Westinghouse since 1909.

•

► Dean H. Mitchell has assumed his new duties as senior vice-president and general manager of the Northern Indiana Public Service Company, Hammond. Mr.

D. H. MITCHELL

Mitchell was one of the speakers at a dinner given recently in Michigan City in honor of H. H. Adams, whom he is succeeding. More than two hundred executives and supervisors of the company and its affiliates attended.

L. M. Klinedinst Appointed to Direct Timken Sales

At a meeting of the board of directors of the Timken Roller Bearing Company, on October 30, L. M. Klinedinst was elected to the board and also promoted to the office of vice-president in charge of sales to fill the vacancy created by the recent resignation of Judd W. Spray. Mr. Spray plans to spend the winter in Florida and rest indefinitely before announcing his future plans.

Mr. Klinedinst has been associated with the Timken company for 29 years, having started his business career there as a young man immediately upon completing school. During his early years with the company he occupied various junior executive positions in both the manufacturing and selling divisions. Subsequently he was closely identified with automotive development work for many years, serving as assistant sales manager during the period when the company's business was largely confined to automotive applications.

Thirteen years ago, when the company started expanding into the industrial field, he was made general manager of the industrial division, in 1930 assuming the duties of vice-president in charge of all industrial sales.

T. V. Buckwalter, who has been vice-president of the Timken Roller Bearing Company for several years, was elected vice-president and director of the Timken Steel & Tube Company.

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► Ralph E. Flanders, president Jones & Lamson Machine Company, has been nominated for the office of president of the American Society of Mechanical Engineers. Mr. Flanders is a member of the Industrial Advisory Board of the NRA and of the Business Advisory and Planning Council.

► Frederick A. Gaby, for many years chief engineer of the Hydro-Electric Power Commission of Ontario, has been appointed assistant to the president of the Canadian Pacific Railway with headquarters in Montreal. Mr. Gaby will have direct charge of the investigation of forms of competition and the policies of the company in respect thereto, as well as the co-operative efforts made jointly with the Canadian National Railways, to increase economies. Mr. Gaby has had an outstanding career in the engineering field and has established an international reputation in connection with his work

Has business any right to profit?

THERE are people who believe that if business would give up the old fashioned idea of trying to make a profit, our troubles would be over.

What is profit anyway? How does it fit into the American scheme?

Let's first see how a business starts. The people in this country want a great many things. They want ease, convenience, health, good food, education, social advancement, better homes and cars, radio, travel. They want to be attractive and have a good time.

The idea in starting any business is to satisfy one of these universal wants. If the business does that, and is well managed, it grows into a profitable enterprise. People are employed and receive wages. Because dividends are earned, other people are glad to invest more of their savings. A community of homes, schools, churches and hospitals grows up around and is supported by the business. Customers, workers and investors all are benefited and none is harmed.

Now suppose the business fails to earn a profit. Investors lose their savings. Workers are laid off. Local merchants are in trouble because customers cannot pay their bills. Mortgages are foreclosed and homes lost. There come hunger, unrest, bread lines, sickness, under-nourished children and increase of crime.

An unprofitable business benefits no one. Our cities, states and national government must collect about eight billion dollars each year to keep going. Either this money must come out of profits earned by business, or national wealth must be confiscated.

America has been built from profits. Profits built our railroads, utilities and industries employing millions of workers. The incentive of profit created the automobiles we ride in, the electric convenience of our homes, the safe and dependable commercial air lines which are the marvel of the world. Profit pays for the inventive genius which almost daily produces better materials and finer products. Profit has paid for the research into pure science which has meant so much to our health.

After paying for materials, labor and taxes, the average business rarely earns more than six percent on the money invested. Many enterprises pay far more in taxes than in dividends. In the past year, railroads paid $249,602,895 in taxes, or $2.61 taxes for each $1 dividend. This slender margin of profit is the real difference between sickness and rather feeble health. Sturdy business health is essential to national well-being and prosperity.

And so, business has more than a *right* to make a profit—it has an *obligation* to make a profit.

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The "know-how" of the Remington Rand organization is the result of literally thousands of individual experiences. The Remington Rand man has nothing to sell except a satisfactory result. He can advise without bias because he represents this complete line of office machines and equipment. His one desire is, "no sale without a profit to the user".

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with the Hydro-Electric Power Commission of Ontario. He first joined the commission in 1907 and acted in the capacity of assistant chief engineer until 1912, when he became chief engineer of that great development.

▶ WILLIAM L. COLLINS, vice-president of the Buffalo, Niagara & Eastern Power Corporation, has been appointed chairman of the Buffalo Municipal Housing Authority by Mayor George J. Zimmermann. Eradication of slum conditions will be the first objective of the new board.

▶ M. S. OLDACRE has been appointed equipment planning engineer in the equipment section of the Commonwealth Edison Company, Chicago. L. I. ANDERSON has been appointed equipment standardization engineer in the equipment section of the company.

▶ FRANK R. DEVLIN, widely known San Francisco attorney, was appointed to the California Railroad Commission to fill the vacancy caused by the resignation of Clyde L. Seavey, who accepted an appointment to the Federal Power Commission. Mr. Devlin has a long career of public service, his record including service on the Railroad Commission from 1915 to 1921, eight years as District Attorney of the city and county of San Francisco and two years as judge of the Superior Court of Solano County (Calif.).

▶ RAYMOND A. HOPKINS, formerly a member of the consulting engineering firm of Hopkins & Gove, Waltham, Mass., has been appointed engineer in charge of hydro-electric station design for the Tennessee Valley Authority, with headquarters at Knoxville, Tenn. Mr. Hopkins was previously connected with the Stone & Webster Engineering Corporation, Boston, for 22 years as an electrical engineer and was in charge of electrical project development for many clients, including the Philadelphia & Reading Coal & Iron Company (ELECTRICAL WORLD, October 25, 1930, anthracite breaker electrification).

▶ WILLIAM F. WYMAN, formerly division manager of the Central Maine Power Company, Augusta, Me., and previously rate engineer of the company, has been appointed assistant to George S. Williams, vice-president and general manager. RALPH KENNISON, formerly distribution engineer and at one time assistant to the operating engineer of the system, has been appointed acting manager of the Central-Southern division in place of Mr. Wyman. H. LATON JACKSON of the general operating department has been appointed distribution engineer, and GEORGE FORBUSH has been made superintendent of stations, succeeding the late Fred Fortier.

OBITUARY

Frank J. Sprague

Frank J. Sprague, outstanding pioneer in the development of electric traction and the high-speed electric elevator, who died October 25 (ELECTRICAL WORLD, October 27, page 44), made contributions in the course of his distinguished career to electrical progress which have vitally affected many industries. His

F. J. Sprague

achievements, in addition to the development of the electric street railway, included the invention of the multiple-unit system of control; the first electric elevator, culminating in the modern dual system using two elevators in the same shaft; automatic remote control system for fire doors, banks, theater curtains and many other purposes, and important features of modern electric railway signals. In recent years he maintained a laboratory in New York, where he was actively engaged until his death.

Born at Milford, Conn., on July 25, 1857, Mr. Sprague attended the U. S. Naval Academy, from which he was graduated in 1878 with honors. After spending a few years in the service he resigned and became technical assistant to Thomas A. Edison. Convinced that the use of electricity for power would rival or surpass its use for lighting, he left Mr. Edison and with Edward Johnson, Mr. Edison's former representative in London, formed the Sprague Electric Railway & Motor Company. It was this company that installed the first electric railway system in the world at Richmond, Va., in 1887 and brought about a revolution in transportation. There he developed his constant-speed electric motor and was the first to engage in general manufacture and introduction of industrial electric motors.

The Sprague Company was absorbed into the Edison General Electric Company in 1890 and Mr. Sprague became consulting engineer. He soon resigned, however, to concentrate his energies on the development of the elevator. He invented a method of operating two elevators on the same rail in a common shaft, as well as acceleration control of car safeties. He invented a system of regeneration used on mountain electric railways and on high-speed electric elevators and developed a system of automatic signal and brake train control to enforce obedience to signals.

Many honors in recognition of his work came to Mr. Sprague, among them the award of the gold medal at the Paris Electrical Exhibition in 1889, the grand prize at the St. Louis Exhibition in 1905 and the Elliott Cresson medal of the Franklin Institute. On July 25, 1932, tribute was paid to him by a large assembly of engineers, scientists, educators and transportation men in New York on the occasion of the 75th anniversary of his birthday, and on January 23 of this year a portrait bust of Mr. Sprague, a past-president of the American Institute of Electrical Engineers and recipient of its Edison Medal in 1910, was accepted by Dr. Whitehead of the institute. More recently he was selected to receive the John Fritz gold medal for 1935. The presentation was to have been made with suitable ceremony at the convention of the A.I.E.E. in January.

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▶ JAMES F. SINCLAIR, general manager of the Jeffery-Dewitt Insulator Company, Kenova, W. Va., died October 23 in Huntington, of a heart attack. He was 57 years of age. Mr. Sinclair had actively managed the company since 1922, but because of poor health had delegated most of his duties during the past two years.

▶ WARREN PARTRIDGE, vice-president of the Utility Management Corporation of New York, a subsidiary of the Associated Gas & Electric Company, died October 30 in Orange, N. J., after an illness of three weeks. Mr. Partridge was 59 years old. After taking his engineering degree at Harvard University in 1897, he obtained his first position with the Associated Gas & Electric Company, and he served that organization in various capacities.

▶ JOHN M. SPLITDORF, inventor of electrical appliances and formerly manufacturer of electrical devices, died October 24, of heart disease, after a long illness. He was 65 years of age. Mr. Splitdorf went to work in association with his father and brother in the Splitdorf Laboratory in New York, which his father had founded in 1858. Subsequently, with his brother Charles, he founded Charles F. Splitdorf & Company in New York, makers of electrical products. He served as vice-president until 1912, when the Splitdorf Electrical Company was formed to succeed the old Splitdorf organization.

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SLIM

By

WILLIAM WISTER HAINES

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BOOK REVIEWS

Electrical Communication

By A. L. Albert. Published by John Wiley & Sons, New York, N. Y. 448 pages, illustrated. Price, $5.

This is a college text treating of the general technical principles and equipment used in electrical communication. It is different from other texts in that it treats of the history and philosophy of communication and holds to essential principles without going into descriptive detail. Sound speech and hearing, electrical fundamentals, transmitters, receivers and loud speakers, exchange and toll systems, telegraph systems, theory of telephone transmission, networks and filters, loaded circuits, interference and electron tube theory and applications and wireless are topics discussed and illustrated. The book gives a splendid survey of the art of communication with sufficient technical thoroughness upon which to build specialized knowledge.

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Der Praktische Transformatorenbau

(Practical Transformer Construction)

By Walter Kehse, Published by Ferdinand Enke Verlag, Stuttgart. 110 pages, 65 illustrations. Price, paper, 7.40 reichsmarks; bound, 8.80 reichsmarks.

This book is intended for designers and builders of transformers, including choke coils and balancing coils for three-wire d.c. operations, and deals with methods rather than theories. The mode of approach is largely by way of numerous illustrative computations. The author has drawn on the practice of a number of well-known manufacturers and brings out some differences between German and American usage. Particular attention is given to the production and characteristics of various kinds of insulating materials and parts, such as tubes, sheets and special forms, the last third of the book being devoted to this part of the discussion.

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Municipal Electric Plant Managers

By Edna C. MacMahon. Published by Public Administration Service, 850 East 58th Street, Chicago, Ill. 41 pages. Price, 60 cents.

In the West North Central area are 36 per cent of the nation's 1,800 active municipal plants listed by town name in this monograph, which has analyzed what kinds of men manage municipal plants, what training they have and how they hold their posts in the face of bureaucratic meddling. Three out of four of the supervisory boards are found to be merchants or men in business life, but the smaller the town the more likely the board is to intrude on personnel matters. Technical advisory aid is at low ebb everywhere. Only one-tenth of the managers have been to college and not more than two-thirds have more than grammar school education. Two-thirds of the electric managers get less than $1,500. The data from 690 plants are set forth in nineteen tables.

•

Edison—His Life, His Work, His Genius

By William Adams Simonds. Published by the Bobbs-Merrill Company, Indianapolis. 364 pages, illustrated with photographs, documents and letters. Price, $3.50.

Probably several hundred years must elapse, at least a few generations must intervene, before it becomes possible for the genius and accomplishments of Edison to be examined with sufficient objectivity for a biography of him to be literature. The contemporary biographer (Boswell is no exception) is not able to select his material and arrange it in the perspective which will present his subject completely and definitively with nothing left over to obscure the picture.

But Mr. Simond's work on Edison is less a mere chronology of events than are many Edison biographies. There is in it a beginning of the discrimination which will make some future writer's "Life of Edison" a masterpiece of literature. Mr. Simonds still uses the language of hero-worship, not so much as have some of his predecessors in writing of Edison, but still too much to allow his book to be clearly set apart from the rest of the Edison biographies on this account. For readability it is exceptional among them and comes close to being a book that will be read as much for its own interest as for its subject. We recommend this book as expressive of the virtues and accomplishments of individualism, a healthy book for this debilitated day.

•

Recent Developments in Industrial Group Insurance

Published by National Industrial Conference Board, New York. 46 pages. Price, 50 cents.

Characteristics of group life, accident and health, annuities and pension plans and dismemberment insurance. Growth, present status and recent advances.

•

Twenty Questions on the Economic Security of the People

By Industrial Department of Y. M. C. A. National Council. Published by Association Press, 347 Madison Avenue, New York. 48 pages. Price, 25 cents.

Timely questions on unemployment compensation, old-age dependency and health insurance, answered by facts but without opinionated conclusions. Digest of European experience and of the Wisconsin and Ohio legislations.

LETTERS TO THE EDITOR

Novel Situations in Europe

To the Editor of ELECTRICAL WORLD:

The other day in Rome I found a rather odd electrical situation. Two companies supply electricity to the city and the lines of both companies parallel each other. There are some situations where both companies have connections to the same building.

Both companies sell energy at the same rates, so neither has an advantage. The rate structure they use is unusual: (1) Energy for illumination is 1.80 lire a kilowatt-hour including a tax of 1 lire; (2) that for room-heating units is 0.80 lire, with no tax; (3) electricity for ranges, refrigerators or water heating is 0.30 lire, with no tax. A lire is about 8½ cents in American money.

Connecting the wrong appliance to an outlet is punishable by a heavy fine. You can imagine the amount of wiring necessary in a house to give reasonable service for all the appliances that might be used.

In spite of this situation the government is building several new sections of apartment buildings on the edge of the city and each is completely electric—range, refrigerator, everything. Rent in these buildings is in proportion to the amount of pay a man receives and the space he gets depends on the size of his family. That's almost an ideal situation.

A little more than a week ago a daughter was born to the Crown Prince of Italy and his wife, the Princess. Rome wanted to celebrate the event, but instead of using strings of electric lights to outline the buildings they wanted to illuminate, as we would have done, the entire Victor Emmanuel monument, Mussolini's office building and the building across the Piazza Venezia were outlined in flickering candles. Maybe the government didn't want to pay its own high tax on illumination electricity.

In Italy I noted new 1934 models of Westinghouse radios in several store windows. General Electric refrigerators, both monitor top and the less expensive models, were displayed in several places. The cheaper machines were being sold in the majority of cases. Here in Interlaken I found a Swiss refrigerator called the Frigidex, equipped with a three-thickness glass back on the domestic model, so it could be used as a display case in small stores, the glass back allowing the customer to see the food inside, while the door was convenient to the clerk behind the counter.

RALPH GATES,
Interlaken, Switzerland.

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has something you want

WHAT QUALITY *above all others* do you want in the Varnished Cambric Tape or Cloth you buy? What *combination* of qualities do you seek?

With Empire Varnished Cloth and Tape, we have been unusually successful in meeting a wide variety of the most exacting specifications of power companies and electrical manufacturers.

These specifications cover dielectric strength, tensile breaking strength, elongation, pliability, finish, uniformity, resistance to aging, and resistance to the severe conditions encountered in making joints and splices.

If you consider your own specifications to be especially exacting, we would like to send you a stock sample of Empire Varnished Tape or Cloth. You put it to your severest tests. We'll rest our case on the results.

Available in yellow or black, straight or seamless bias cut. In tape form or in full width materials.

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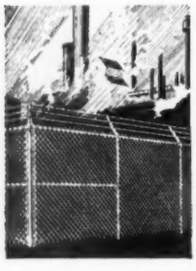
How much do YOU bid?

How MUCH is it worth to you to absolutely protect your property and equipment from damage? What would it be worth to you to be assured that outsiders could not enter your property? Unnecessary losses which amount to millions of dollars annually can easily and economically be avoided.

Because of the superior quality of raw material, hot-dip galvanizing processes and expert erection service Cyclone Fence gives added years of service. Because it is made better and lasts longer Cyclone Fence Property Protection costs but a few cents per day.

Eliminate the possibility of costly damage, theft and liability suits. Find out how little it will cost to fully protect your property. An accurate estimate will be furnished without obligating you in any way. Write for catalog. Address Dept. E.W.



Cyclone Fence
REG. U.S. PAT. OFF.

Cyclone Fence Company

General Offices: **Waukegan, Illinois**

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

BRANCHES IN PRINCIPAL CITIES

Pacific Coast Division:
Standard Fence Company
Oakland, Cal.

Cyclone—not a "type" of fence, but fence made exclusively by Cyclone Fence Company and identified by this trade-mark.

Recent Rate Changes

Detroit Edison Company's legal battle with the Michigan Public Utilities Commission over the 1933 order demanding $1,500,000 rate reductions ended recently with formal acknowledgment by the commission that the company had complied, in effect, by granting to commercial users $1,700,000 reductions. This, it was stated, will not affect the suit by the city of Detroit and the Michigan Manufacturers' Association, in which reductions of $2,500,000 are sought for private users.

•

Michigan Public Utilities Commission has ordered an audit and appraisal of the Consumers Power Company for the purpose of ascertaining whether the rates and charges for services are just and reasonable and, in the words of the order, "to aid us in performing our duties in supervising and authorizing capitalism and security issues." For at least twenty years no complete audit and appraisal has been made of the company's property.

•

Ohio Edison Company's dispute with the city of Akron over rates, dating back to May 1, 1933, was brought to a close recently when the Ohio Public Utilities Commission dismissed the appeal of the company from the Sanderson-Bixler ordinance rates, and the city agreed to the action. This step takes out of litigation the entire electric energy rate argument, releases the Ohio Edison's $300,000 bond, posted to protect the consumers in event of a refund, and marks formal acceptance by the commission of the rates recently agreed upon by the city and the utility, and which are now in effect.

•

Yonkers Electric Light & Power Company has been ordered by the New York Public Service Commission to make a reduction of 6 per cent in its electric rates, effective November 10. The cut will mean an annual saving of $140,000 to all general metered consumers of the company in the city of Yonkers. The reduction will remain in effect until a final determination is made in the proceedings now before the commission. It leaves the company a return of 6 per cent upon the rate base of $14,373,000, which is the amount determined for the purpose of setting temporary rates.

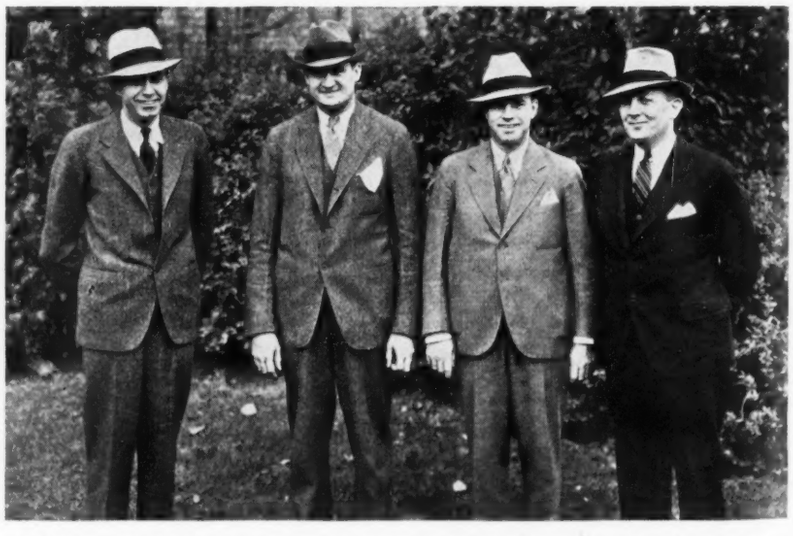
•

Ontario Hydro-Electric Power Commission has given final approval to recently announced reductions in rates for rural service. The cut means an average saving of 75 cents a month to power users in 27 rural power districts of the province. In the plan provision was made for rebates or bonuses on the use of electric power for pumps for domestic use, radios and washing machines. Rebates are expected to reach $62,000 a year.

•

Carolina Power & Light Company's small power users will get a reduction in rates effective Decebmer 1, according to Stanley Winborne, chairman of the Utilities Commission of North Carolina. The reduction will be effective in both North and South Carolina, although the exact amount of saving cannot be stated.

LARGE PRE-CHRISTMAS SALES PREDICTED



Frigidaire officials reported excellent prospects for winter buying activity upon their return to Dayton from a tour of sales centers east of the Rockies. Left to right, Lee A. Clark, sales planning manager; H. W. Newell, vice-president; Charles T. Lawson, household division manager, and Frank R. Pierce, sales manager

Moloney Power Transformers Are a Guarantee of Uninterrupted Service

QUALITY and the resulting RELIABILITY are demanded of power transformers. Failures in service are costly from every angle and must be carefully guarded against.

Sound judgments regarding equipment of this nature can only be made in the light of past experience. In this respect MOLONEY is proud of its record, as MOLONEY power units hold a unique position—burnouts being negligible.

This enviable record is a result of a contribution of many factors, the most outstanding of which is a constant vigilance of minute details, which in their sum total spell—QUALITY.

Add together such things as: thirty-eight years' experience, highly trained technical staff, skilled workmanship, modern plant facilities, uniformly high grade materials, and it is readily understood how QUALITY is attained through the perfection of every detail in MOLONEY power transformers.

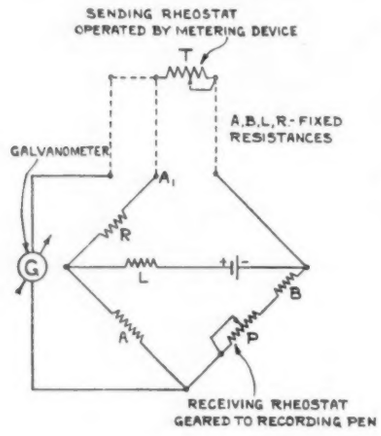
Moloney Electric Company
St. Louis, Missouri

MOLONEY TRANSFORMERS

NEW EQUIPMENT

Electronic Relay Facilitates Telemetering

An electronic relay is the basis in a new telemetering system developed by the Bailey Meter Company, Cleveland, Ohio, for measuring pressure, temperature, liquid level and other factors at distant locations, recording as many as four factors on one 12-in. diameter circular chart. The transmitting element consists principally of a variable resistance unit which is operated by the metering device.



Bailey Meter

For distances up to 10 miles accuracy to within 1 per cent scale reading is reported by the use of a three-wire circuit (telephone lines may be used). For distances less than 3 miles the two-wire connection may be used. In this case the galvanometer is connected to the bridge at A_1 and accuracy to within 1 per cent maximum scale reading is reported.

In view of the low current, dry cells, used to produce the necessary direct-current supply, should last from six months to one year; vacuum tube amplification is used for the transmitted current. No special filters and insulating transformer equipment ordinarily required with certain types of transmitting systems are necessary to eliminate telephone interference.

•

Hot-Dip Galvanized Conduit

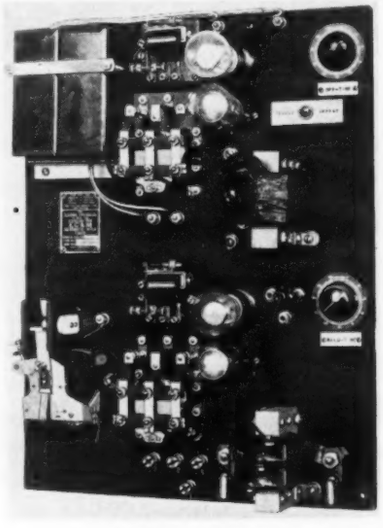
Hot-dip galvanized conduit on which the threads have been zinc coated has been announced by the Enameled Metals Company, Pittsburgh, Pa. Both the inside and the outside of the pipe are hot-dip galvanized, with the threads zinc coated. The interior of the pipe is also given an additional coat, over the zinc, of a linseed-oil-base, elastic-black enamel, making a smooth and non-soluble raceway for wiring. The exterior of the pipe is super-coated with a clear acid-proof enamel as added protection.

•

Automatic Repeat Time Welder

For use in connection with resistance welding machines in which the electrodes of the welder are air- or motor-operated, the Electric Controller & Manufacturing Company, Cleveland, Ohio, announces an EC&M automatic repeat weld timer. It is the same as the standard EC&M automatic weld timer except that it has an additional timing circuit for governing the length of time the electrodes of the welding machine are separated to allow the work to be moved to the position where the next weld is desired. The welding period provided by this timer varies in inverse proportion to the rate of current flow, insuring that the correct number of heat units are put into each weld, while the off-time or period the electrodes are apart is a definite length of time which is adjustable.

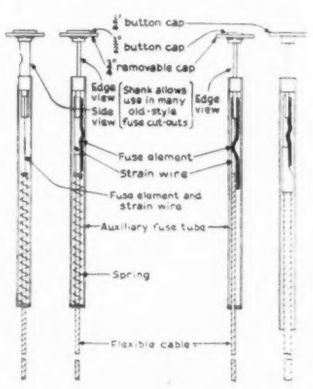
Some types of automatic repeat weld timers employ motor-driven cams to operate the magnetic air valve controlling the electrodes and to close the magnetic contactor handling the main welding current, in which case it is necessary to vary the length of the cams to adjust the welding time and the off time. With this repeat weld timer there are two separate electrical circuits, easily adjustable and independent of each other.



Electric Controller & Mfg.

Cable-Type Fuse Links for Expulsion Fuse Cutouts

A line of cable-type tension fuse links for all types and makes of distribution fuse cutouts operating on the expulsion principle at 15,000 volts or less has been announced by the General Electric Company. To relieve the fusible element of tensile stress, when the link is used in indicating or drop-out cutouts, a strain wire of monel metal is used in parallel with the fusible element. These cable-type fuse links can be co-ordinated with each other and with G.E. low-temperature fuse links. Co-ordinating charts for series operation of fuse links of these various types can be obtained from the company.



General Electric

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PHOTO-ELECTRIC TUBES, sensitive only to definite bands of invisible ultraviolet radiations, have been announced by the Westinghouse Lamp Company to meet a demand growing out of an increasing use of ultraviolet radiating devices for therapeutic and germicidal purposes. They are available in various types with threshold values of sensitivity set at different points in the ultraviolet spectrum so that radiations can be studied qualitatively as well as quantitatively.

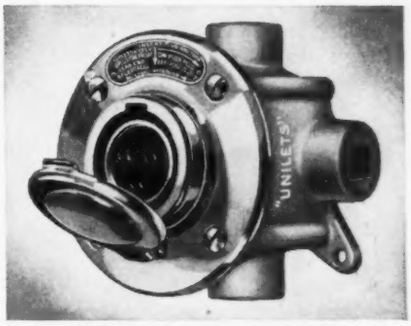
•

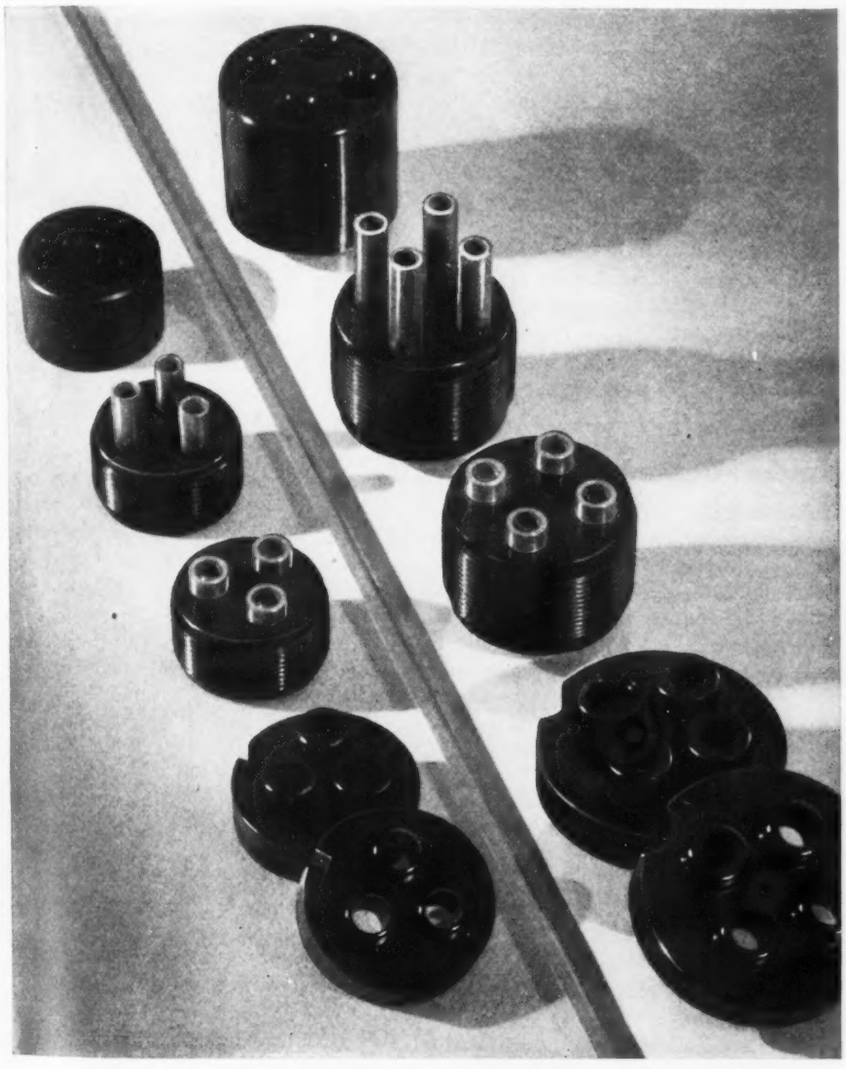
A HANDLE-TYPE CORD CONNECTOR with flush door receptacle for power and signal circuits is a new product of the Cannon Electric Development Company, Los Angeles, Cal. The sockets are taper-bored to collapse and compress the split plug into positive contact. This 90-deg. fitting cannot be pulled from the wall by the cord. Moreover, the pendant position of the cord is said to prolong its life at point of entry into the fitting. The

"EXPLOSION-PROOF"
receptacles and plugs with
Bakelite Molded insulation

THESE armor-clad, heavy duty, "explosion-proof, dead-end" Unilet receptacles and plugs required molded insulation parts of the most substantial and durable insulation material available. After being subjected to rigorous tests to determine durability under abnormal conditions Bakelite Molded was selected.

In addition to high insulation value and physical strength, the use of Bakelite Molded provided other advantages. Close dimensions were assured and consequently complete interchangeability made certain. Metal inserts were firmly embedded in the molding operation. Uniformly accurate threading was also formed in the mold. When used in the presence of acid or chemical fumes the Bakelite Molded insulation could be relied upon to successfully withstand them.





Manufacturers of electrical apparatus and electrical devices, in ever increasing numbers, for heavy duty are discovering the combination of desirable properties possessed by Bakelite Molded in addition to its recognized high insulation value. Some of these are: stability, strength and durability; resistance to moisture and extremes of heat and cold; resistance to chemicals and chemical fumes, and to oils and greases.

We invite you to consult us about Bakelite Molded in connection with your own needs, and also to write for booklet 3M."Bakelite Molded".

At left: Bakelite Molded insulation parts used in Unilets made by Appleton Electric Co., Chicago.

BAKELITE CORPORATION, 247 Park Avenue, New York, N. Y. . . . . 43 East Ohio Street, Chicago, Ill.
BAKELITE CORPORATION OF CANADA, LIMITED, 163 Dufferin Street, Toronto, Ontario, Canada

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THE MATERIAL OF A THOUSAND USES

company's line of four-pole plugs for 440 volts a.c. has been given the Underwriters' approval.

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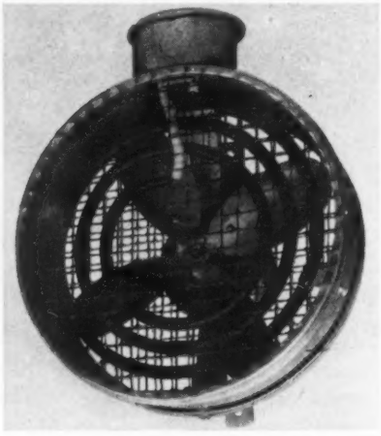
Blower-Heaters

Electric heaters embodying blower fan and having a rating of 1.5 kw. upward have been developed by the Harold E. Trent Company, Philadelphia. Special



Harold E. Trent

attention has been given to the placing of the heating unit in regard to the characteristic air curve of the fan blades. These equipments are made both for stationary and portable use and are light in weight, weighing only 11 lb.

•

Motor With Built-In Speed Reducer

With built-in speed reducer, the type K3-M 1/7-hp. Dumore (universal) motor, equipped with single gear reduction, has been announced by the Dumore Company, Racine, Wis. Three gear ratios can be supplied from stock, 5:1, 14½:1 and 34:1, giving shaft speeds of 1,300, 448, and 191 r.p.m., respectively. The gear unit can be positioned on the motor case so that the gear shaft projects at any desired angle in relation to the vase, but always at right angles to the armature shaft.

•

ELECTRIC OPERATOR for car and hoistway doors has been announced by the Otis Elevator Company. This operator, known as Type O, provides power operation for elevator car and hoistway doors. The doors are power-opened and spring-closed and are cushioned at the end of travel in either direction. The hoistway door is driven by the car door. Hoistway door locks and contacts act as true interlocks as defined by the American Standard Safety Code for elevators.

Self-Stabilizing Welder

Improved, portable, single-operator arc-welding sets which retain the proved characteristics of previous models and incorporate recently developed refinements have been announced by the General Electric Company. Self-stabilization is the outstanding feature of the new arc welders, an advantage which provides excellent performance throughout the entire welding range, using any type of electrodes, bare, lightly fluxed or heavily coated.

The improved welders belong to the WD-30 line. Each welder is a self-contained unit, having no external reactor, resistor or separate exciter. Separate controls are provided for adjustment of welding current and welding voltage. These controls are located on a dead-front panel on top of the machine and at the most convenient height above the floor.

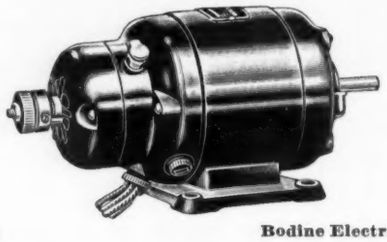
All working parts of the machine are thoroughly protected against damage from water or other foreign materials by completely drip-proof construction. The entire welding set is low-hung on a three-wheeled truck which provides unusual portability and mechanical stability, without sacrificing road clearance. The set may safely be tipped as much as 22 deg. from the vertical.

•

Governor-Controlled Series Motors with Running Gear

An addition to its line of electric governor-controlled motors has been announced by the Bodine Electric Company, Chicago. Ratings range from 1/75 to ¼ hp. The new line is available in series and compensated series types of motors with an approximate speed range from 500 to 7,500 r.p.m. These motors are also available wtih built-in worm gear speed reducers of various ratios, the highest of which is 60 to 1.

The accuracy of speed control closely approaches the performance of synchronous motors. The present speed is not readily affected by variations in load if the loads are kept within the capacity of



Bodine Electric

the motor. These electric governors are of two forms, form R can be adjusted while the motor is running and form S can be adjusted only at standstill.

ENGINEERING DATA FROM MANUFACTURERS

Bulletins and catalogs now available to engineers by manufacturers and associations

STATIONARY STORAGE BATTERIES—Bulletin No. 950, the most recent publication of the Gould Storage Battery Corporation, Depew, N. Y., includes terse, practical technical data of value to electrical and operating engineers. Made up in loose-leaf form of 50 pages, it gives descriptive and application information with recommendations that will assist the proper choice of a battery. The information is so complete that any engineer may design an installation from the dimensions given.

GOVERNOR - CONTROLLED UNIVERSAL MOTORS — Bodine Electric Company, Chicago, Ill., Catalog Section 2040. Describes design, operation and application of constant-speed direct-current and single-phase motors. These motors are practicable only in small sizes, the upper limit being about ⅛ hp. Equipped with speed reducers, however, they perform admirably in special fields.

The "New Story of Seeing" tells how to use the Sight Light Tester Kit to increase residential lighting revenue by house calls. Sample check record is enclosed. The Sight Light Corporation, Chrysler Building, New York.

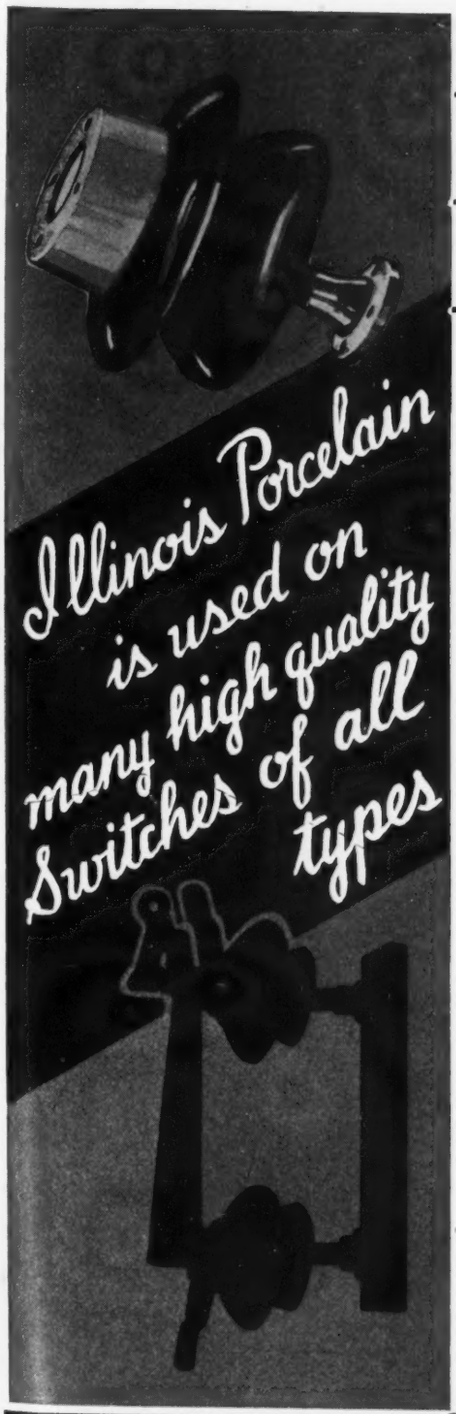
Pittsburgh Lectromelt Furnace Corporation (P.O. Box 1125, Pittsburgh) has published new bulletin describing top-charge furnaces in capacities from 50 lb. to 50 tons; construction, operation, economies.

For users of magnet wire a limited number of copies of Belden Manufacturing Company's 9-page pamphlet on Celenamel (cellophane covered Beldenamel) are available. It gives the physical and electrical properties in detail. Chicago, Ill.

Electrical and other physical properties of the fiber products of National Vulcanized Fiber Company, Wilmington, Del., are detailed in a new 32-page booklet.

In new Bulletin 516 of the Louis Allis Company, Milwaukee, Wis., entitled "Shaftless Motors" are structural details, methods of application and dimensions for sizes ¼ to 30 hp.

"Preliminary Compounding Information" on "Thiokol" B, Bulletin 1B is a recent publication of Thiokol Corporation, Yardville, N. J. It gives specific instructions for mixing Thiokols A and B with rubber, zinc oxide, etc., to obtain particular physical properties.



ADD TO *equipment dependability*

SPECIFY *accurately designed, super-quality*

ILLINOIS PORCELAIN

Illinois engineers design and produce porcelain mechanical spacers, of highest quality, for all types of electrical equipment. Years of experience together with extensive manufacturing and testing facilities is a positive assurance of modern design. The ability of this organization to provide the correct mechanical spacer affords an opportunity for manufacturers of electrical equipment who are seeking to improve the quality of their products.

Perfectly balanced interior stress is a feature of Illinois porcelain as is its homogeneity of structure, high dielectric strength, and permanence of exterior glaze.

We make porcelain products in both wet or dry process as required and in every case add greater dependability to equipment. You buy mechanical spacers of longer life for every requirement.

ILLINOIS ELECTRIC PORCELAIN CO.
MACOMB, ILLINOIS

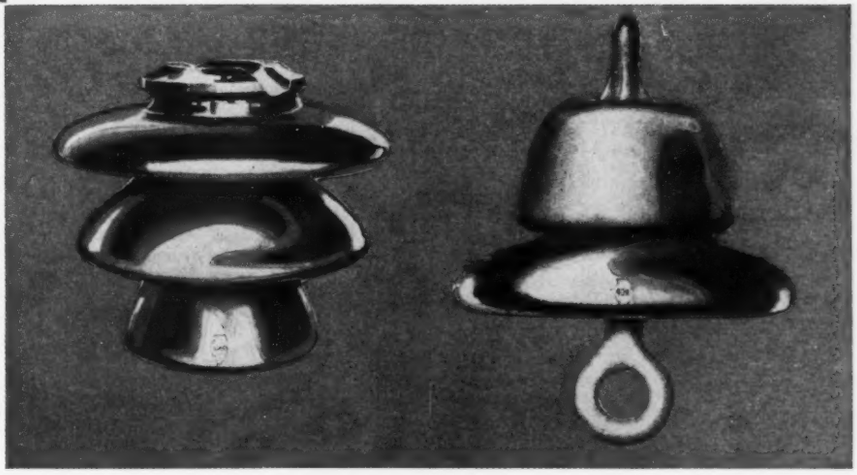
to Standardize on

ILLINOIS

is a Progressive Step

CENTRAL LOCATION INSURES QUICK DELIVERY anywhere in U.S.

- **ACCURACY IN DIMENSIONS**
- HIGHEST QUALITY PRODUCTS



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SALES OPPORTUNITIES IN NEW CONSTRUCTION

Spot coverage of new work. Projects approved and proposed, bids requested, equipment wanted, funds available. Prospects for the electrical manufacturer.

DAYTON, TENN. — Tennessee Valley Authority, Knoxville, Tenn., plans 22,000-volt steel tower transmission line over Tennessee River, near Hazle Ridge Shoals, in connection with new high-tension power line between Athens and Dayton, Tenn., where commercial power will be furnished. Application for permission has been made.

TOLEDO, OHIO — E. I. du Pont de Nemours & Company, Wilmington, Del., plans installation of motors and controls, conveyors, etc., for expansion and improvements in former plant of Mountain Varnish & Color Works, Toledo, recently acquired at a receiver's sale, to be operated in future as branch factory. Cost about $250,000.

BOULDER CITY, NEV. — Bureau of Reclamation, Denver, Colo., asks bids until November 19 for one station service penstock for Boulder power plant, Boulder Canyon, California-Nevada (Specification 633-D).

LOS ANGELES, CALIF.—Los Angeles Water and Power Bureau, D. P. Nicklin, purchasing agent, asks bids until November 14 for transmission line hardware, overhead conductors, Boulder Dam power transmission line, including clevis type fittings for rod connections, plate connections or standard suspension; arcing horns, strain yokes, strain insulators, extension link strain insulators, etc. (Specification 1545). At same time, for 3,850 feet 49-conductor, rubber-insulated, lead-covered cable, comprising Nos. 16 and 25 AWG wire (Specification 1519).

DOVER, OHIO—Plans new electric generating station in connection with city-owned electric light and power plant. Fund of $330,000 is being arranged through Federal aid.

KNOXVILLE, TENN.—Director of Purchases, Tennessee Valley Authority, asks bids until December 3 for furnishing and installing complete two 56,000-kva., vertical-shaft a.c. generators at Norris hydroelectric power plant, and for one similar unit, 36,000 kva. rating, for Wheeler hydroelectric power plant.

WASHINGTON, D. C.—Bureau of Supplies and Accounts, Navy Department, asks bids until November 20 for six electric furnaces for Newport, R. I., and Newport News, Va., Navy Yards (Schedule 3705); at same time, for quantity of electric storage batteries and spare parts for Portsmouth and Norfolk, Va., Brooklyn, N. Y., Mare Island, Calif., Puget Sound, Wash., and other navy yards (Schedule 3657).

NEW ORLEANS, LA.—Public Belt Railroad Commission, City Hall, asks bids until November 22 for complete electric lighting systems for combined highway and railroad bridge over Mississippi River, New Orleans. Work will be carried out jointly by city and state. Modjeski, Masters & Case, Inc., Harrisburg, Pa., is consulting engineer.

ROCHESTER, MINN.—Soon takes bids for new addition to city-owned electric light and power plant. Cost about $100,000, with equipment. Schuett-Meier Company, 490 North Snelling Avenue, St. Paul, Minn., is engineer.

WASHINGTON, D. C.—Chief of Ordnance, United States Army, asks bids until November 19 for two transformers, one 150-kva. transformer, one motor-generator set, 30 electric motors, three individual motor-drive attachments, 23 electrical equipments (Circular 8). Until November 20, for one electric furnace for iron and iron alloys, one electric furnace for brass and bronze alloys, five pot type electric furnaces, two pit type electric furnaces, two electric tempering furnaces, and other furnace units (Circular 17).

PECOS, TEX.—Plans early call for bids for about 11 miles of new transmission lines, to operate at 10,500 volts, for service at city-owned waterworks station; also for motor-driven pumping units, motor-driven centrifugal boosters, controls, etc. Fund of $300,000 has been arranged for project. B. G. Warner, Pecos, is engineer.

BUFFALO, N. Y.—Pennsylvania Railroad Company, New York, N. Y., plans installation of motors and controls, conveyors, loaders and other equipment at proposed new coal unloading and distribution terminal and trestle on Hamburg Turnpike. Cost over $1,000,000.

NEW ORLEANS, LA. — Sewerage and Water Board asks bids until December 27 for quantity of power cable for underground service (Schedule 128-D); also for installation of underground lines from Station D to Stations 3 and 5. Until January 3, 1935, for installation of underground cable lines from Power House 2 to Stations 1 and 6. Until January 10, 1935, for installation of underground cable lines from Station 3 to Station 7, and from latter station to Station 6 (Schedule 131-D).

ST. CLAIR, MICH.—North American Distilleries, Inc., Edward A. Loveley, president, recently organized, plans new multi-unit plant with power house on St. Clair River, near St. Clair. Cost over $125,000. Financing is being arranged.

NORFOLK, NEB.—Is considering report of Black & Veatch, Mutual Building, Kansas City, Mo., consulting engineers, for new city-owned electric light and power plant, and electrical distribution system. Proposed to call special election for approval of bond issue of early date.

BALTIMORE, MD. — Chevrolet Motor Company and Fisher Body Company, both Detroit, Mich., will install motors, cranes, hoists and other electric power equipment with total load capacity of about 5,000 kw. in new multi-unit assembling plant in Canton industrial district, Baltimore, for which general contract recently was let. Cost over $750,000. Proposed to use central station service from lines of Consolidated Gas, Electric Light & Power Company, which is understood to be closing contract for power supply. Albert Kahn, Inc., New Center Building, Detroit, is consulting engineer.

KNOXVILLE, TENN.—Director of Purchases, Tennessee Valley Authority, asks bids until November 13 for furnishing, fabricating and delivering penstock trash-rack metal work for Wheeler power plant, including structural-steel guides, plates, trashrack bars, guide bars, etc.

WASHINGTON, D. C.—Board of District Commissioners plans construction of power plant to cost about $1,000,000, with equipment, in connection with new sewage disposal plant for District. Motor-driven pumping units and auxiliary equipment will cost about $100,000. Entire project will cost $8,000,000, and is scheduled for completion in 1936. Financing is being concluded through Federal aid. Metcalf & Eddy, Statler Building, Boston, Mass., are consulting engineers.

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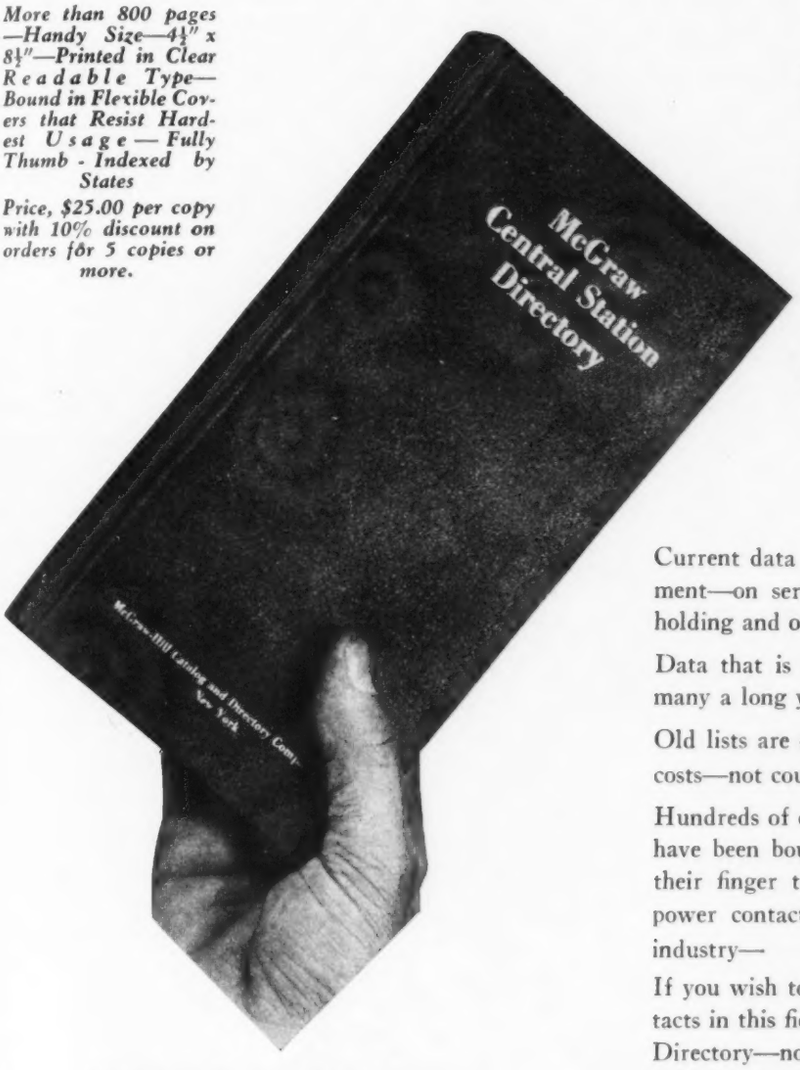

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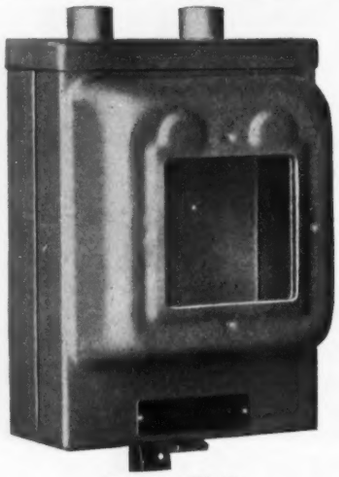
WALKER OUTDOOR PRESSED STEEL CABINETS



Cat. No. W-18

The above outdoor meter cabinet for use without test block. Takes all smaller meters. Walker Drawn Front Cabinets are made of copper bearing steel, galvanized after fabrication. Standard cabinets have knockouts in back, sides and bottom. Any cabinet can be supplied with threaded hubs of any size in any desired location. Send for catalogue showing complete line of indoor, outdoor and metering transformer cabinets.

"A WALKER CABINET FOR EVERY PURPOSE"

WALKER ELECTRICAL CO.
ATLANTA, GEORGIA

Robbins & Myers Net Totals $75,515

For the fiscal year ended August 31 net profit of Robbins & Myers, Inc., and subsidiaries amounted to $75,515 after depreciation, federal taxes, etc., equal to 75 cents a share on 100,920 no-par shares of 6 per cent cumulative participating preferred stock on which there is an accumulation of unpaid dividends. This compares with net loss of $116,042 in 1933.

•

Leonard Shipments

Leonard Refrigerator Company shipments to customers during the company's fiscal year ended September 30 were 40 per cent ahead of shipments for the previous twelve-month period and 60 per cent greater than 1932 sales.

•

Gilby Wire Organizes French Company

Wilbur B. Driver, president of Gilby Wire Company, Newark, N. J., announced upon his return from Europe the establishment of a new French company to take over the European business of the Newark company. The new company, known as Gilby Wire Société Anonyme, will have its main offices in Paris. Gabriel Fodor, formerly European manager of the Gilby Wire Company, will direct the affairs of the new company.

•

Kelvinator Plans Merchandising Program

The most expansive merchandising program ever mapped by Kelvinator Corporation's commercial sales organization was revealed to the company's commercial field representatives at the annual fall conference held recently in Detroit. The meeting was held to review Kelvinator's record-breaking 1934 performance and to lay organization and merchandising plans for next year.

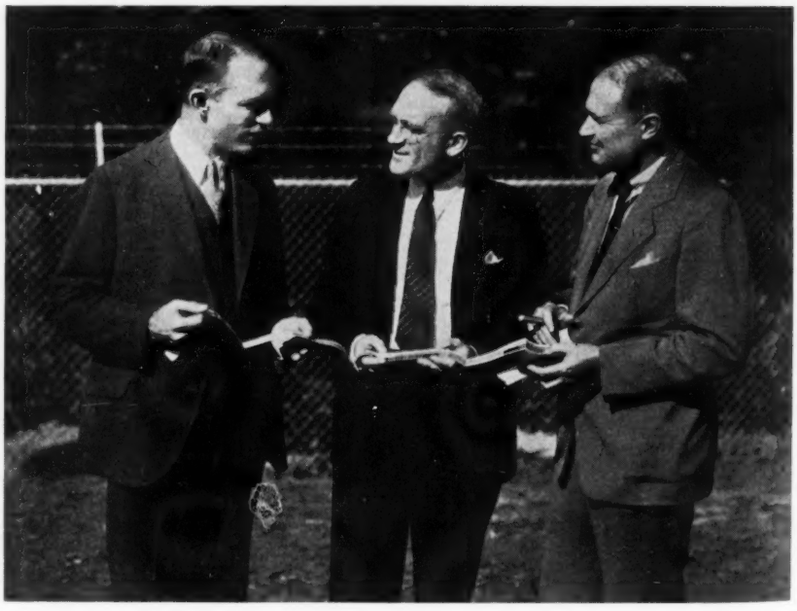
District managers, national direct sales managers, branch commercial sales managers and public utility representatives attended the sessions, which were presided over by J. A. Harlan, Kelvinator commercial sales manager. Topics under discussion centered around air conditioning, automatic heating, liquid cooling, water coolers, sales promotion, service, advertising, and general policy.

Reviewing the 1933-34 accomplishments in his introductory remarks, Mr. Harlan pointed to a 37 per cent increase in commercial sales over the previous twelve months as evidence of the effect of improved organization upon the division's activities.

Electric Bond and Share Company

Two Rector Street
New York

LIGHTING TAPE MEASURE



Introduced recently by the Incandescent Lamp Department of General Electric Company, the lighting tape measure, prescribing correct bulb sizes for easy seeing under various types of floor and table lamps at varying distances from the bulb sockets, has already passed the two-million mark. Looking over the millionth measure that came off the presses are, left to right: H. F. Barnes, sales promotion manager; E. E. Potter, Eastern sales manager, and N. H. Boynton, Western sales manager of the G. E. Incandescent Lamp Department

Building Up Appliance Load

[*Continued from page 81*]

small appliances by the present customers therefore afford the chief prospects in this field.

But ir mechanical refrigeration a different picture emerges. Plainly, it is out of the question at present to have every home provided with a refrigerator. But it is clearly not impossible so to equip one home in four, at any rate as to urban homes, for that goal has already been achieved in three of these 63 cities. How many are actually operated otherwise than by electricity we are not informed, but all are potential electrical business.

Taking 25 per cent, then, as a bogey, we can estimate the number of refrigerators still needed to bring each section up to that level. The total comes to about 2,000,000. The table shows the estimate in detail. Only non-farm homes have been considered. The potential use of appliances by the country's 6,600,000 farm homes has been ignored, because statistics collected in urban communities may not be applicable.

For electric cooking the market may be set at 20 per cent, which has already been surpassed in individual cities, though some clearly show the effects of competitive natural gas. This estimate results in a total still required to give 20 per cent saturation of more than 4,000,000 homes.

Assuming an average annual consumption of 575-kw.-hr. per refrigerator and of 1,750 kw.-hr. per range, these loads call for the use, respectively, of nearly 1,200,000,000 kw.-hr. and 7,000,000,000. Together, they would increase the present domestic consumption by two-thirds.

•

Appliance Selling Course Offered by Waters-Genter

A thoroughgoing course in retail salesmanship, covering the entire electrical appliance field and offered without charge to appliance sales forces, has been announced by the Waters-Genter Company, manufacturer of the Toastmaster line. More than 5,000 retail salespeople have already enrolled in the course, it is reported by K. C. Gifford, sales manager of the domestic appliance division of the company. The course is considered unique in that it is supplied without charge either to the salesman or his employer and covers the selling of all types of electrical appliances, instead of concerning itself solely with the manufacturer's own products.

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VARNISHED CAMBRIC CABLE

Crescent Varnished Cable insulation provides maximum dielectric properties. The cambric is saturated with special non-hardening, insulating varnish, which provides strength and permanent flexibility but will not flow when used in vertical risers and has great resistance to heat.

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All kinds of Special Wires and Cables for Signals, Radios, Annunciator Systems, Bridges, etc., where highest uniform quality and longest life are essential.

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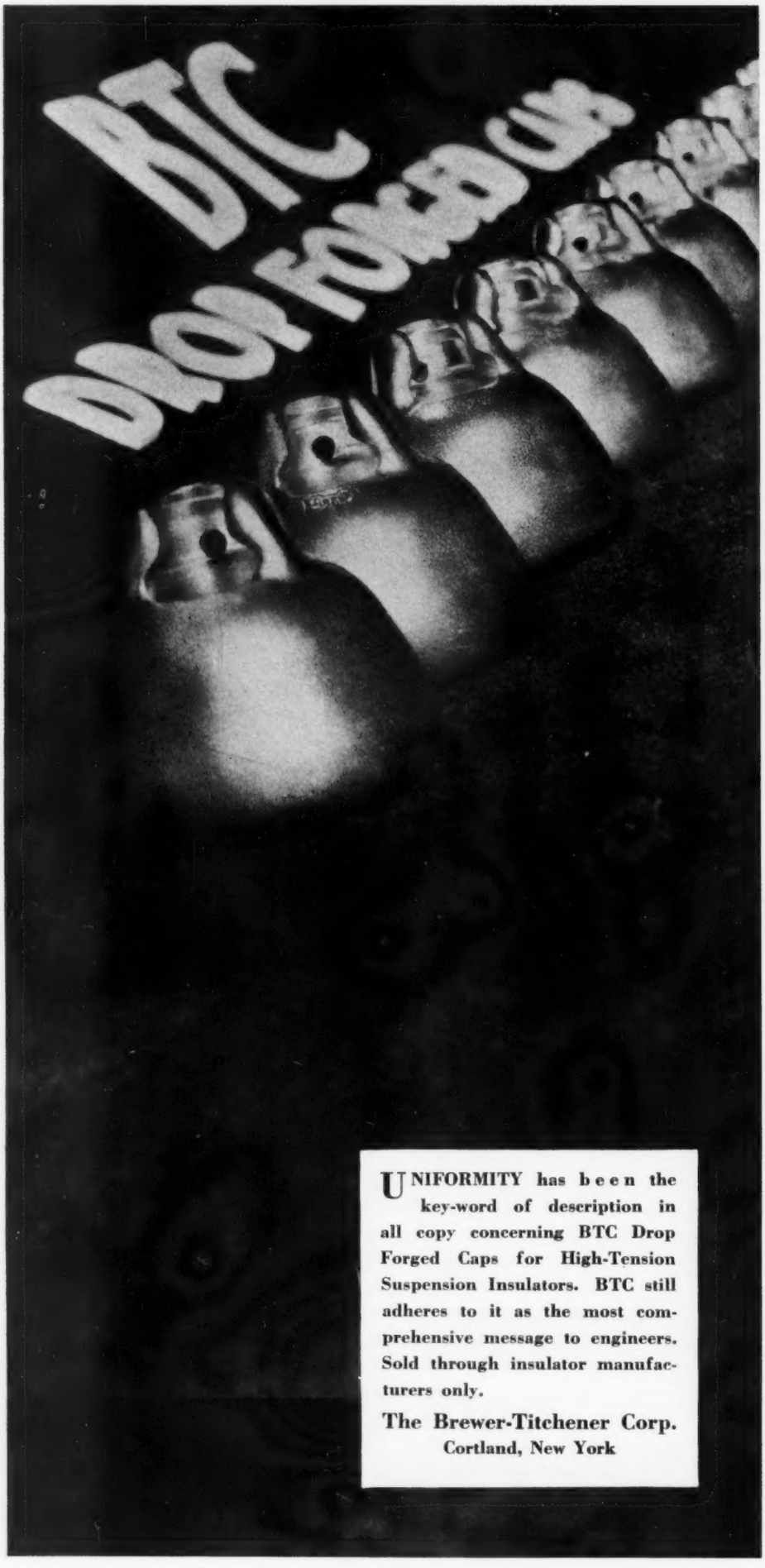

UNIFORMITY has been the key-word of description in all copy concerning BTC Drop Forged Caps for High-Tension Suspension Insulators. BTC still adheres to it as the most comprehensive message to engineers. Sold through insulator manufacturers only.

The Brewer-Titchener Corp.
Cortland, New York

Personnel Changes

▶ F. D. BARTOW of J. P. Morgan & Company has been elected a director of General Electric Company.

▶ M. A. BUETTELL, formerly connected with the Dodge Manufacturing Corporation, has joined the Ideal Commutator Dresser Company in the capacity of electrical engineer.

▶ F. R. KOHNSTAMM has been appointed manager of the lighting division of the Westinghouse Electric & Manufacturing Company, with supervision over all lighting activities, including sales, engineering and manufacturing, now conducted at the Westinghouse Cleveland works, in Edgewater Park. Until his appointment he was sales promotion manager of the company with headquarters in East Pittsburgh.

▶ FRANK J. CONNOLLY has been appointed sales engineer for the New York office of the Allen-Bradley Company, located in New York. Mr. Connolly received his technical training at Tufts College and Massachusetts Institute of Technology. He has had wide experience in the application of electric motor and control equipment and will be in charge of sales engineering in Manhattan and the Bronx territories.

▶ JAMES A. COOK, general manager of the Lynn Gas & Electric Company, has been elected chairman of the New England Electrical Equipment Committee, recently established to carry on regional work in interchanging recent practices and to follow up progress in apparatus design as of interest to the northeastern utility groups. A. O. Summerville, electrical engineer for Charles H. Tenney & Company, Malden, Mass., and staff associate of the New England Power Engineering & Service Corporation, has been made vice-chairman. R. D. Harrington, sales engineer Electric Storage Battery Company, Boston, is secretary.

▶ M. B. STEELE, formerly of the sales promotion department of Steel & Tubes, Inc., Cleveland, Ohio, has been transferred to Boston, Mass., as sales engineer, where he will handle "Electrunite" conduit, boiler and condenser tubes and other company products. Mr. Steele was connected with the high-voltage research work of the Westinghouse Electric & Manufacturing Company at East Pittsburgh, Pa., and Worcester, Mass., under the late Dr. Harold B. Smith for two years following his graduation from the Worcester Polytechnic Institute. He then went to Cleveland in the research department of the Steel & Tubes organization and was in charge of the plant electrical engineering service until 1931, when he entered the sales field.